

**DAMAGING FLUCTUATIONS, RISK AND POVERTY: A REVIEW**

[Background Paper for the World Development Report 2000/2001]

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# I. INTRODUCTION

Words strain,  
Crack and sometimes break, under the burden.  
Under the tension, slip, slide, perish,  
Decay with imprecision, will not stay in place [Eliot, 1944]

## I.1. Damaging fluctuations, risks and causes of poverty: some key distinctions

There are only three proximate causes<sup>2</sup> of falls in private consumption poverty:

- The average person's lifetime consumption rises;
- The distribution of lifetime consumption shifts towards the initially poor;<sup>3</sup>
- For the poor and near-poor, **damaging fluctuations (DFs)**<sup>4</sup> in consumption are better managed.<sup>5</sup>

Overall, most panel data suggest that between one-fifth and half<sup>6</sup> the people below a 'poverty line' at the time of a survey are not usually poor, but have been pushed into poverty, sometimes by 'life-cycle events'<sup>7</sup> but often by DFs. Growth, redistribution, and better DF management are also the only proximate causes of poverty reduction defined more broadly, e.g. to include inadequate health or education, or possibly concepts such as social exclusion, relative deprivation, etc. The causes may combine to reduce poverty; alternatively, favourable trends in one cause may be offset by reverses in another, e.g. rising average lifetime consumption by worsening distribution. Any of the three causes may itself be due to outside events, private actions, and/or policy measures: the actions or measures may or may not be aimed at poverty reduction, or at the particular proximate cause that they influence. And, importantly, DF-reducing or other poverty-reducing direct effects of measures or actions can be amplified - or made counter-productive - by side-effects on events or other private actions: e.g. public insurance provision can crowd in, or crowd out, private saving or risk-avoiding action. The welfare impact of any of the causes can be strengthened – or offset – by events

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<sup>2</sup> In line with Bongaarts's distinction, in the case of fertility change, between 'proximate' causes (such as age of marriage or use of contraception) and 'ultimate' causes (such as female education) that underlie them. As in that case, the 'proximate causes' are merely a tautologous, though one hopes useful, classification; the important causes of changing poverty (or fertility change) are 'ultimate', but these can operate only via proximate causes.

<sup>3</sup> Any indicator of poverty that measures severity (e.g. alpha-2) – rather than incidence or intensity – is also reduced by redistribution of lifetime consumption from poor to even poorer people.

<sup>4</sup> (a) New or key terms are block-typed and where necessary defined on first appearance. (b) DFs may 'fall' in frequency, size or covariance. (c) DFs need not be always down or up. In farming, usually 5 percent above- or earlier-than-average seasonal rain is good, 10 percent below or later bad, and 25 percent below, above, earlier or later disastrous.

<sup>5</sup> (a) Some policies aim at several objectives, e.g. irrigation at the first and third; employment guarantee schemes at all three. (b) Reducing poor people's DFs probably induces them to be less risk-averse and hence to take actions tending to increase average lifetime consumption. (c) However, *maximising* progress towards one objective normally retards the others. For instance, an irrigation scheme will use a different layout and water management (i) to maximise extra net farm production over time or (ii) to minimise DFs in output due to bad rains.

<sup>6</sup> In unirrigated semi-arid or arid rural areas the proportion is usually higher than elsewhere.

<sup>7</sup> Nuclear family households in developing countries are most poverty-prone 5-10 years after couple formation, when there are often several small children and only one earner.

affecting the **resilience** of the poor and near-poor, i.e. their ability to escape damage due to poverty. And the same proximate cause (including a policy) may affect groups of poor people differently.<sup>8</sup>

A DF is likely to prove more damaging, especially to the poor, if it was not perfectly predictable, i.e. was a **risk**. A risk is a DF that is not certain in any given future period, but is possible often with a numerical probability. This may be discoverable, and if so may be known to all, some,<sup>9</sup> or no affected parties. The cost of planning and implementing responses are more for risks than for other DFs, and so is the likelihood that those costs will turn out to have been wasted; these higher costs mean that risks normally place the poor at a greater disadvantage than other DFs of similar size and frequency.<sup>10</sup> Risks are also important for the poor because they interact with unfavourable trends, and with other DFs (e.g. predicted seasonal variations). If there is always a 10 per cent rise in food prices, and a 20 per cent rise in work requirements, in the pre-harvest season it is much easier to handle than if these are only expected values with a big risk of much larger, and an equally big hope of much smaller, fluctuations. All these variations in time also interact with variations over space. Especially for poorer people, riskiness around a DF makes that DF itself harder to handle. With the passage of time, all risks either become DFs (because they have started to happen, or because they have become certain or highly probable), or do not materialise. Forecasting risks and turning them into (more manageable) DFs is one key component of their management – and one to which the poor often have less access than others.

Perfectly predicted, risk-free, ‘sure’ DFs - such as a normal pre-harvest season with more work and dearer, or less, locally available food - might be thought to have little effect on welfare or poverty. Will not people, anticipating such DFs, smooth consumption and well being perfectly? Planning and implementing such smoothing has costs. Learning about, and planning to deal with, even risk-free DFs requires information and time. Carrying out the plan – e.g. building and filling a grain store, or seasonal borrowing – requires resources, or access to credit or social networks. These requirements both divert income from consumption (in itself more serious for the poor) and are harder to meet for the poor. Hence poor people are less able than others to maintain even food consumption, well-being or anthropometric status, even in normal, fully predictable hungry seasons such as the ‘soudure’ in West Africa [Chambers, Longhurst and Pacey, 1981; Ferro-Luzzi, 1985].

Unexpected DFs are sometimes called ‘shocks’. In this paper we avoid this term, and follow ordinary language in calling them ‘risks’. ‘Shock’ runs together four issues related to DFs: their source, the stress they impose on systems, the resulting strain on persons, and the resulting damage [Payne and Lipton, 1994].<sup>11</sup> The term ‘shock’ in this context seems

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<sup>8</sup> Failure to recognise this induces fruitless debates, e.g. between those who show that growth is accelerated by trade liberalisation and that this tends to reduce poverty, and those who show that some groups of poor people have lost due to globalisation-induced growth. These findings are fully compatible.

<sup>9</sup> This is the case of ‘asymmetric information’, so crucial to risk analysis and management.

<sup>10</sup> Two examples: (1) A rural household with limited or uncertain access to grain or credit markets carries some stocks against normal seasonal variation - but more if climatic variation brings a risk of higher-than-normal shortfalls; these extra stocks mean extra diversion of savings from production to protection. (2) Inflation, if perfectly anticipated, raises the nominal cost of borrowing; but if there is risk of incorrect anticipation then the interest rate is increased further, to allow for lenders’ extra risk.

<sup>11</sup> ‘Shock’, when used of DFs, connotes – and usually confuses - (1) unexpectedness (i.e. the risky DF happened, though it had low ex-ante probability), (2) size, (3) high *damage* due to concentration on persons with high vulnerability and low resilience, (4) exogenousness in the *source* of a DF, (5) engineering *stress* to a system generated by that DF, (6) physical or psychological *strain* to one or more individuals due to that stress.

confused and confusing and seems more appropriate to ‘sources of disturbance in a system that come entirely from outside it, like earthquakes in an economy’. But that will not happen. All risks are DFs; not all DFs are risks.

There is an important distinction between ‘partial DFs’ in particular areas such as health or harvest, and ‘total DFs’ affecting consumption, income, or ‘welfare’ as a whole. The distinction is especially important for the poor. Given their exposure level to each type of DF (i.e. its size, frequency, bunching, etc.), their vulnerability to (and therefore aversion from) a type that is covariant with other types of DF is especially high. So it is right to attend to the effect of the whole set of DFs to which a poor person or group is subject. However, we cannot confine ourselves to analysing only total DFs. First, some sorts of DF (one’s own death is a striking instance) reduce well-being so drastically that they cannot be offset by gains elsewhere. Second, expectations of remedy (‘responsibility’) for reducing exposure, vulnerability, and aversion for different sorts of DF - from pest attack in a field to nationwide drought, from personal injury to epidemic, domestic violence to war, building subsidence to earthquake - are divided differently among victims, kin, insurers, communities, State ministries, and foreign helpers, and are associated with distinct problems of asymmetric information.<sup>12</sup>

Nevertheless, especially for the very poor, reducing vulnerability to consumption declines due to DFs in the *total* set of activities is, often literally, vital. Two things follow. Individuals, kin and community groupings need information to help them reduce vulnerability, if possible without large losses in average income and output and without large income transfers from the poor to the rich or the State. *And a State or a foreign donor, if poverty reduction is its priority, needs to co-ordinate the impact of its actions (allowing for incentive-compatible responses to them) on DFs to consumption among main poverty groups*, because this impact is affected by: DFs in, and covariance among, their sources of income; consumption smoothing; and safety-net support. Obvious as this is, we know of no country or donor that now does it.<sup>13</sup>

Before clarifying the relationship between DF management and other types of poverty reduction policy (growth and redistribution), we recall, or in some cases introduce, eight distinctions.

- Sure DFs (e.g. hungry seasons), risky DFs (e.g. droughts), worsening trends;
- DF-reducing, -mitigating,<sup>14</sup> and -coping strategies (see p. 6): this distinction is crucial to this WDR and to the policy approach of the Social Protection Division of the World Bank;

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<sup>12</sup> ‘Asymmetric information’ arises when some parties to an arrangement know details relevant to its effects, but others do not, and this affects the decision whether to enter into an arrangement (adverse selection) or how to behave afterwards (moral hazard). Asymmetric information is very important in insurance, credit, and many other treatments for various sorts of risk.

<sup>13</sup> The policy papers of the World Bank’s Social Protection Division show intent to do this. To achieve it, the Division may need (a) to shift its portfolio towards low-income countries, and away from formal social insurance and adjustment compensation that seldom affects the poorest people; (b) to oversee the risk/DF Impacts on the poor of choices (e.g. in irrigation, or sequencing of liberalisation) throughout the Bank and borrowing countries.

<sup>14</sup> The two main mitigating strategies are insurance and diversification. The latter is based on the distinction between partial and total DFs, and exploits the fact that not all types of *item within an individual’s portfolio* are subject to DFs at similar times. Insurance also exploits that (in the case of risks), among *persons or households* exposed to a particular risk (normally idiosyncratic risks are much more insurable than highly covariate ones).

- Partial vs. total DFs: total DFs affect ‘portfolios’ yielding income, consumption, or well-being; partial DFs affect only one source of these, e.g. health or harvest; partial DFs of one type are thus mitigated if they can be made less ‘covariate’ with partial DFs of other types;
  - DFs ‘covariate’<sup>15</sup> among potential victims - persons, households, communities, transactors, etc. (e.g. bad harvests) vs. DFs normally ‘idiosyncratic’ to individuals (e.g. heart attacks);
  - Income/production vs. consumption/well-being DFs: a major strategy in face of production and/or income DFs is ‘consumption smoothing’; poor people’s imperfect access to low-cost forms of smoothing - and therefore, in view of their high DF-aversion, undue reliance on high-cost forms - is a substantial reason for vulnerability and slow income growth;
  - Unit of fluctuation and stability: individual, household, village, caste, province, nation, etc.: DFs affecting a household are not always ‘fairly’ shared among individuals and acceptably non-intrusive policies may improve this. Individual and national ‘food security’, while related, do not ensure each other and may move in opposite directions;
  - Types of cost due to DFs, e.g. disease, war or drought: direct costs of suffering or discomfort; opportunity costs of income foregone; costs of treating or coping; and ‘aversion costs’, both overall (of adopting lower-risk but lower-profit activity sets:<sup>16</sup> - see below) and direct (avoiding specific risky places or activities, e.g. disease-prone places).
  - Exposure, vulnerability and overall aversion to DFs:
- (a) Exposure to a DF in a period, say five years, increases with its **size, frequency, earliness, and bunching**<sup>17</sup> *within* that period. The poor are more exposed to some common DFs, especially risky ones - from infant mortality and residence near seismic fault-lines, through loss of urban jobs, to rainfall failure in drought-prone areas. However, this does not apply to all DFs, risky or other. The poor were *less* exposed than the rich to income loss in the 1997-8 financial crisis in Indonesia, and to droughts in Gujarat, India, in the 1970s [Poppelle, Sumarto and Pritchett, 1998; Sambrani and Picholiya, 1975].
- (b) Vulnerability to given absolute exposure increases with a DF’s **unpredictability** (riskiness), **covariance with other DFs**, and **exposure relatively** to the portfolio; and with a person’s lack of resilience (often due to poverty, e.g. via barriers to consumption

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<sup>15</sup> We dislike this term. It creates confusion between this and the previous point; wrongly suggests that covariance (rather than risk of combined DFs that lower well-being, etc., below a critical level) measures the problem; and suggests that reducing ‘covariance’ among potential victims, or among types of DF, is the only remedy, obscuring the possibility of changing *membership* of the set of activities or of potential victims (e.g. by including non-farm activity in a credit or insurance scheme; by defining the amount of a given scheme to include different agroclimatic zones). Unfortunately the term ‘covariate risk’ is too deep-rooted to legislate away!

<sup>16</sup> This happens because risk premium increases with risk exposure [Kalecki 19xx]. Each new or enlarged DF, in a portfolio with any risk, adds to the downside riskiness of that portfolio, and hence to the premium needed to accept any further risk (the premium measures risk aversion).

<sup>17</sup> Bunching of DFs, given their size and frequency in a period, can happen because of within-period (a) aftershocks: fluctuations, damaging or not, that are serially correlated, i.e. a fluctuation in a short sub-period makes another in that or the next sub-period likelier; or (b) (de)stabilisation: the probability of fluctuations within the period, or part of it, has a time-trend; or (c) asymmetry: DFs are likelier in one sub-period, and advantageous fluctuations in another. With positive interest rates, people prefer DFs to happen later in the period rather than sooner. With limited resilience, bunching of DFs is normally damaging. For most sorts of natural disaster, such as earthquakes, and also for economic downturns, larger and more serious events tend to be rarer than small ones. This inverse relationship between size and frequency of DFs implies a similar inverse link between size and bunching - bigger DFs are almost always less frequent within any sub-period. Nevertheless, big DFs may increase the likelihood of smaller ones close in time (warning tremors, aftershocks).

smoothing). The poor and near-poor are most vulnerable to a given DF exposure, having few reserves (whether of body fat, stores of food or cash, or access to credit).

- (c) Aversion, overall, increases with **vulnerability, exposure, and past bad experience of handling DFs** – bad luck, market access or skill, including with risk management. DFs, apart from inflicting direct misery in bad times, induce people to adopt cautious and non-entrepreneurial strategies in normal times, reducing their prospects of long-term advance. The poor – having worse experience of managing past DFs, and being more vulnerable and at least as exposed to DFs in bad times - are likelier to be cautious in good times. This makes it more likely that they stay in or near poverty, while the nonpoor seize the gains from new prospects, thus worsening inequality.

## I.2 Outline of the paper

This paper is about (i) effects of DFs, particularly risks, on the poor, and (ii) individual, group, market, or policy options that could improve DF management for poor people by reducing, mitigating, or coping with the results of, risks and other DFs. Our analysis and evidence are confined to events, actions and policies directly affecting the poor via DFs. To the extent that events, actions or policies speed up consumption growth, or improve its distribution, and hence reduce<sup>18</sup> poverty, they will indirectly reduce vulnerability, usually aversion, and often exposure, to DFs as a whole, but this may not apply to particular types of DF. Reduced partial DFs do not imply, and are not implied by, reduced total DFs.

Section I explores links between reducing DFs and attacking the other two proximate causes of poverty. It looks at the meaning, logic and typology of DFs, including risks, and the links among (a) poverty and (b) exposure, vulnerability and aversion to (c) DFs (including risks). Section II reviews evidence on how risks and other DFs affect the poor. Which DFs are more – or less – serious for various sorts of poor people, as regards exposure, vulnerability and aversion? The issue is explored for the main types of DF that cause or deepen poverty:

- Disease or injury;
- Violence, including domestic, criminal, and war-related;
- Natural disaster;
- Harvest failure;
- Terms-of-trade deterioration, especially affecting the price of food relative to that of labour;
- Reduced access to productive or income-earning work.<sup>19</sup>

The six categories shed some light on the controversial question of how adjustment affects the poor. As regards risk and DFs for the poor, only those in the last two categories are likely to be affected; and early adjustment (stabilisation plus liberalisation) probably induces or increases them. Liberalisation tends to raise the price of tradable, including food, by devaluation and/or reductions in protection of industry and in negative protection of agriculture. Both liberalisation and stabilisation tend to reduce public-sector employment. In the longer term, however, economic logic – and some of the experience – suggests that

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<sup>18</sup> Cuts may be in incidence, intensity, or severity of poverty. Policy choices, including those against DFs, will differ according to which is targeted.

<sup>19</sup> Apart from the presence or absence of covariance among various types of risk, each type can itself be covariate or idiosyncratic among persons, e.g. job losses can affect a worker because her unique skill is no longer demanded, or as part of widespread job losses in the wake of macro-economic contraction.

adjustment should stimulate faster growth, and lead poor and labour-abundant countries to specialise in labour-intensive activities, in both cases raising the mean income of the poor and thus lowering their *vulnerability* to any given DF. Yet, by inducing specialisation, even long-run adjustment increases *exposure* of a person's total portfolio to the last two types of DF. If she loses from unfavourable movements of demand for a particular commodity that she makes, or is employed to produce, that loss is less likely to be offset by favourable movements in other commodity lines, because specialisation means that her sources of income, at least from work, have become less diversified. Specialisation also tends to reduce the share of activity undertaken for subsistence, raising the exposure of the portfolio to price fluctuations, often in world markets. Hence consideration of DFs, especially the last two types, underscores the importance of mobility – and hence flexibility, education and information – if adjustment, though raising the welfare of the poor in normal times, is not to increase damage from fluctuations in the short and medium term. The fact that the first four categories of DF are *not* affected by liberalisation, moreover, underlines the importance of safety-nets that provide general protection against DFs and risks, as complements to adjustment: adjustment helps to raise the poor's long-run mean income, while better safety-nets offset the danger that the poor are damaged by concomitant increases in total portfolio fluctuation and risk.

The six DFs are *mutually exclusive*, though some may help to cause others (events such as recessions may cause more than one). The six are not *jointly exhaustive* of all DFs affecting the poor, but may jointly account for over 90 per cent of downward fluctuations in poor people's income and consumption. Well-being depends on more than income and consumption – equanimity in face of, and capacity to avoid, 'the wrong sort of stress'; realised mental and physical capabilities; happiness in family life; friendship; stable community; clean, pleasing surroundings; fair and effective law and government - but these too are likely to be unfavourably affected by the above 'big six'.

Crosscutting issues affect each of the six types of DF, and recur through section II:

**Differential incidence and severity** by policy-relevant groups (other than poor-nonpoor and intra-poor, the main focus of this paper): e.g. gender, age (as between children, the old and others), location (urban-rural, hilly-coastal, etc.).

The extent to which each type of DF, given exposure, is manageable: e.g. **predictable** (non-risky, or less risky); **insurable**; **smoothable** in respect of welfare or consumption impact; **non-covariate, with other types of DF and thus diversifiable, or among persons and thus insurable** – for example, neighbours (including lenders) tend to be damaged at the same time by income losses due to flood, but not by those due to heart disease, so that it is easier to smooth the latter losses by appeal to credit or social networks.

Section III explores policy options for improving the impact on the poor of DFs or ill effects of exposure, vulnerability or aversion.<sup>20</sup> What is covered by types of public policy (or private action) against DFs: reduction, mitigation and coping?

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<sup>20</sup> Aversion may be bad because (1) a person is made miserable by the possibility of an event that can be avoided only at a cost, if at all, or (2) people avoid promising prospects, harming their long-run welfare, to cut DFs.

- (a) Reduction involves removing or reducing the DF itself or its source, e.g. when reliable irrigation reduces year-to-year fluctuations, due to variable rainfall amount or timing, in water supply to farming.
- (b) Mitigation involves reducing the negative impact of a particular type of DF through any of several routes, including: **protecting** against its effects, e.g. immunisation, or house-building to resist flood or earthquake; **decoupling** partial from total DFs - rendering a DF less covariate with others - e.g. by **diversifying** into crops with varying responses to rainfall times and amounts, or activities not covariate with agriculture; **forecasting**, thus turning a risk into a well-predicted DF, e.g. weather forecasts of late rains, permitting amended sowing times; or **consumption smoothing**, so a DF reducing income has less, or no, effects on consumption or welfare, e.g. through grain stores or credit; or **insuring** idiosyncratic risk, or even some moderately covariate risks, e.g. hail.
- (c) Coping involves actions after a DF strikes, to reduce the damage, e.g. - in areas affected by severe drought - gathering of wild foods, or distributing food aid.

Reduction is better than mitigation, which in turn is better than coping - given the costs, and effects on income and distribution. In practice, all these will vary among three approaches, in ways dependent on local circumstances and types of DF.

Of special relevance to this paper, some approaches are specially useful – or useless – for the poor, or some groups of them. Reliable water from deep tubewells can greatly reduce risk for bigger farmers with more capital, while achieving little or no buffering for micro-farmers, the landless, or even local food consumers. If the aim is to steer DF mitigation towards some of the poor via better access to credit for consumption smoothing, small loans from informal, NGO-linked lenders are usually likelier to help than is formal bank credit.

These options to improve DF impact on the poor may be at individual, household, group, or policy level. A recurrent issue in Section III is that of ‘crowding out’. Will a policy that improves poor people’s position in face of a DF (e.g. by subsidising administrative costs of credit for consumption smoothing) induce them to rely less on private options for DF management, such as extended family support, or planting robust crops like cassava? Such ‘crowding out’ is often condemned. It is a form of moral hazard: because outside parties provide, free or at a price, improved methods of DF management, the protected party behaves in ways likely to incur more DFs, raising costs to the insurer or protector [Jimenez and Cox, 1992]. But Ravallion [1988] points out that such ‘crowding out’ – a form of ‘moral hazard’ may, even net of such costs, be desirable, e.g. stimulating a shift into riskier but typically more profitable crops, or allowing individuals to choose market or public provision rather than fear-driven reliance on often quasi-feudal bonds to extended kin, clan, tribe or caste.

### I.3 Links between DFs and other proximate causes of poverty

There has recently been major progress - to be reviewed in WDR 2000-2001 - in understanding what types of *growth* and *redistribution* are beneficial, harmful, or neutral (1) for each other [Kanbur and Lustig, 1999], and (2) for poverty reduction.<sup>21</sup> Less is known

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<sup>21</sup> (a) Growth and redistribution normally reduce poverty, but very recent data have confirmed widespread, and in several countries very large, rises in inequality [Cornia, 1999; Kanbur and Lustig, 1999], so that poverty has been getting less responsive to growth. (b) These new data may also ‘pension off’ the view – sensible given the data then available - that distribution normally changes so slowly that growth is overwhelmingly the main determinant of poverty reduction [Bruno, Ravallion and Squire, 199x]. (c) However, that paper and Deininger

about the linkage from poverty impacts of *DFs* (or managing them) to those of low means or high inequality (or improving them). However, in most cases poverty will not be cured *only* by better management of *DF*; growth or redistribution will usually be needed too. This can be shown in three ways.

- *DF* reduction, mitigation or coping is important, in large part, because low mean income and/or great inequality leave the poor highly exposed, averse, and vulnerable to *DFs*. This is partly a matter of arithmetic – more inequality or lower average welfare, by making the poor poorer, increases their vulnerability to any given level of *DF* exposure; so, if incomes remain very low and unequal, the cost and difficulty of treating *DFs* is likely to be large, and thus not affordable for States which, under such conditions, are poor also. Arithmetic apart, inequality and low income help to *cause* inefficient private *DF* management; for example, by keeping low-income groups so poor that they are regarded as unacceptable credit risks, and thus can seldom smooth consumption efficiently, and therefore are especially reliant on costly methods of doing so. Thus extremely low and unequal incomes, unless improved by policy, greatly raise the cost and difficulty of policy for managing *DFs* better.
- Aversion from risk and inequality can each be empirically shown independently, but both depend in large part on people's belief that twice as much consumption generates less than twice as much well being.<sup>22</sup> If this consensus justifies policy intervention to improve the treatment of *DFs*, it justifies redistributive intervention too. Support for policy actions to reduce the *DFs* facing the poor, and for policy actions to raise their welfare by equalisation, stem in part from the same basic belief. Thus, though each type of policy incurs opposition from (different) interest-groups, it would be strange for a government to undertake ever-expanding budgetary and political costs of *DF* management, inevitably with decreasing returns, while avoiding any equalising policies that sought the same goals based on the same consensus.
- Often poverty persists where there are few fluctuations, but consumption is very low at the mean, or very unequal. Thus in some cases better *DF* management will not make much impact on poverty, but faster growth or greater equality will.

Even given the amount of growth and redistribution that can be achieved, policies for better *DF* management help the poor. But usually growth and redistribution increase the gains from better *DF* management, and are themselves advanced by it. Good anti-poverty policy will exploit this synergism by seeking growth and/or redistribution alongside improved *DF* reduction, mitigation and/or coping.

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and Squire [1996] show that there is no global relationship between growth and subsequent changes in inequality, though in some countries growth (decline) seems especially good (bad) for equalisation, and in others the reverse applies. (d) Clarke [1997] shows some link between income inequality and subsequent slower growth, but this is controversial. The links of high inequality of land [Deininger and Minten, 1999] and of human capital [Birdsall and Sabot, 1993] to subsequent slower growth are more clear-cut.

<sup>22</sup> This is why risk aversion and inequality aversion have similar mathematics, and are hard to tell apart empirically [Kroll and Davidovitz, 1999]. However, Arrow's theorem – that risk aversion happens if and only if there is diminishing marginal utility of consumption – is correct only assuming that exposure to risk does not of itself change one's satisfaction. In fact, those with happy experience of managing (and responding psychologically to) risk are likely to be less risk-averse than others; and 'others' will over-represent the poor. This is part of the reason why the poor are more averse to risk - and also to inequality, even if they make choices under 'the veil of ignorance'.

Given mean consumption – over all persons and years – equalisation, and reducing or better managing DFs (including risks), are ‘substitutes’ in achieving poverty reduction, in two ways. (a) Equalisation and DF treatment both reduce the poor’s vulnerability to DFs, respectively by raising their mean income and by better management of their DFs. (b) Less harm to the poor - whether due to equalisation or to treating DFs - in bad times, too, means less DF-aversion in normal times, and therefore less cautious, more productive activities: crop-mixes, choices of schooling, etc. Conversely - given the (all-person all-year) consumption mean - greater exposure or vulnerability to DFs brings greater ‘cost’, especially to the poorest, of a given level of inequality.<sup>23</sup>

Though higher mean incomes for the poor (via growth or equalisation) and reduced or better-managed DFs are ‘substitute routes’ to a given fall in poverty, they are not equally easy, cheap, or even feasible. Gelbach and Pritchett [1997] argue that there is a strong political-economy argument that overt redistribution will minimise the political, and hence financial, support for anti-poverty schemes, whereas achieving the same goals (ex-post including some redistribution) via better DF management – specifically, insurance – will recruit more support from the rich and powerful. However, in practice, a mixture of the two routes is usually the most promising approach. It is not plausible that poverty will often be greatly reduced by better management (including reduction) of DF/risk alone, without supporting policies to accelerate growth and provide (redistribute) access, and sometimes assets and income, to the poor - especially because *much ‘bad’ management of DFs is due to market failures caused in large part by asset inequality and extreme poverty*. For example, the very poor are often driven into harmful coping strategies after DFs, or over-cautious production strategies in anticipation of it, because – having little or no collateral - they often cannot borrow in order to smooth consumption. Lenders deny credit, being reluctant to raise interest for poor borrowers with little collateral, in the justified fear that the poor – despite their high risk aversion – will be drawn by such lending into riskier activities, since risks can be shared with the lender through default [Stiglitz and Weiss, 1981].<sup>24</sup>

Anti-poverty policies should not crowd out good DF and risk management, especially by the poor, and often should include it. A wide range of policies, not only safety nets, have (with varying success) sought to reduce, mitigate, or help cope with DFs and risks especially damaging to the poor. Vulnerability in bad times, or timidity at all times, in face of exposure to DF (including risk) is often an important, and sometimes a neglected, *component* of poverty. But it is not the *same* as poverty, nor the *main cause*. Many people face few risks, or even fluctuations, yet have very low average income, health and education. Many rich people successfully manage severe DFs, some perfectly predicted, others risks. Furthermore, better risk and DF management and reduced vulnerability are seldom ‘easy ways out’ that avoid the hard (and complementary) options: policies for faster growth and/or reduced inequality. On the contrary, the hard options are the best route to the ways out.<sup>25</sup>

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<sup>23</sup> ‘Cost’ measures two things: damage, or expense incurred to avoid damage or to cope after the DF/risk has happened; and foregone income and/or output due to adopting a lower-risk, lower-mean-income strategy in normal times in order to reduce the likely frequency, size, or damage when the DF/risk does happen.

<sup>24</sup> A related point: those anyway at high risk of disaster may adopt a ‘gambler’s throw’ strategy if they can borrow – purchasing ‘hope’ at the cost of a probable bad outcome that they see, even if very likely, as making a desperate situation no worse. For evidence of this from Bangladesh see Shahabuddin *et al.* [1984].

<sup>25</sup> Similarly, improved crop storage, and rural non-farm development, are not ‘easy ways’ to rural development that avoid the need to increase farm output and/or get assets (land, education, etc.) to the poor; on the contrary, farm growth and distribution are the best paths to incentives for improved storage and broad-based rural non-farm growth.

## I.4 Issues in risk measurement

Risks are imperfectly predictable DFs. Vulnerability to **basic damage** (a fall below some threshold of poverty, illness or non-education) arises from the prospect that risk in one sphere of life may push welfare or consumption in a period, given the totality of DFs experienced by a person or household, below a disaster threshold. However, most of the mathematics of risk analysis is about variation - whether in time or in space, up or down, fluctuating or trended, and desirable or DAMAGING – and therefore, while essential in risk analysis, is misleading unless used with great care.

Measurement and mathematics of risk deal largely<sup>26</sup> with variation, whether

- i. in space or time,
- ii. the bigger variations tend to be up or down,
- iii. they are bunched or spread out,
- iv. they occur sooner or later,
- v. or not across a ‘disaster’ threshold,
- vi. they appear in a particular variable or a total portfolio,
- vii. independent of who is (or are) at risk.

But those exposed to risk care about (i) timing, (ii-iv) avoiding big downward fluctuation, earliness of these, and their bunching; (v) disaster avoidance, (vi) selection, reduction, mitigation and coping in respect of partial DFs and risks from each main activity, and of their portfolio, so as to reduce total DF and risk, bearing in mind possible trade-offs against raising well-being in normal times, (vii) allocating improvements in average well-being, traded off against risk reduction, among beneficiaries within a household, and perhaps outside it.

Consider these problems with respect to the coefficient of variation, CV or ‘variability’ (standard deviation as a proportion of the mean). CV is probably the commonest measure of fluctuations in a set of events, given its mean or ‘expected value’. Does this capture DFs or risks in such a set?

- (i) Timing: The CV has no time dimension. For a given set of 100 deviations around a given mean, CV has the same value whether the ten worst outcomes arrive scattered at fairly equal intervals through the 100 years, or in the first ten years. Yet a poorer, more vulnerable, more risk-averse ‘customer’ is clearly worse placed to tolerate repeated bad outcomes, especially in early years. Having no time dimension the CV tells us nothing about whether fluctuations are harder to handle because bunched within a period, or because they happen early in it.
- (ii) Insensitivity to whether big fluctuations are downward: Two sequences of outcomes, A and B, can have same mean and CV, and thus could be thought on standard measures to have the same profit-attractiveness and also the same risk; yet B involves less downside fluctuation at the cost of a somewhat lower ‘most likely’ outcome (mode), and so is more attractive to the more risk-averse (e.g. because more vulnerable and poorer) person, while his better-off and less vulnerable neighbour is either indifferent between A and B, or chooses B. Suppose that A results from a choice of rice varieties that, with given input costs, will in ten years produce six harvests of 9 quintals of rice (the mode),

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<sup>26</sup> The issues raised here can be dealt with. There is plenty of risk mathematics that handles total portfolios vis-à-vis single elements, disaster thresholds, etc. But the standard analyses of variance and covariance – central to most simple accounts – ignore such matters. Our discussion is in no way a critique of mathematics, which we are incompetent to undertake, but a reminder that ‘a little learning is a dangerous thing’.

three of 6 quintals, and one of 10 quintals.<sup>27</sup> The mean harvest is 8.2 quintals, the standard deviation 2.16 quintals, and the CV therefore 27 per cent. Sequence B is the expected outcome of a varietal choice producing six harvests of 7.4 quintals, one of 6.4 quintals and three of 10.4 quintals. This sequence has the same mean and CV as sequence A. Yet the more risk-averse farmer, other things equal, is likelier to choose B, and to want rice research priorities that make it possible.<sup>28</sup>

- (iii) Disaster risk: B is even more clearly preferred to A as less risky, despite identical mean and CV, if 6.2 quintals is a ‘disaster level’, e.g. for a small-farm household with no other means of support - or, to combine the message of (i) and (ii), if two successive harvests below 6.3 quintals would spell disaster. Such households might well prefer B even if A were made more attractive by raising the harvest in the three worst years from 6 to 6.1 quintals, so that A had a higher mean and lower CV than B.
- (iv) Partial and total risk: The household pattern of returns and risks does not derive only from net rice income. Other things equal, more ‘one-farm-product risk’ is acceptable if other net farm income is substantial and either very stable, or (usually even better) contravariant with ‘one-farm-product’ net income; or if non-farm income is substantial and either stable or contravariant with farm income; or if expenditure risks (e.g. of higher consumer-goods prices, twins, sudden medical costs) are small, stable, or covariant with income risks. Reducing rice CV might thus *damage* the risks-returns anatomy of a portfolio as a whole, even for a very poor household. It has been found in both Nigeria [Adubi, 1996] and Bangladesh [Shahabuddin *et al.*, 1984] that, given the level of real income per person, non-farm income is a substantial, consistent reducer of rural risk-aversion (and hence increase of farm profitability) - more so than farm income or household characteristics.<sup>29</sup>
- (v) Within-household allocation: The gender and age distribution of downturns in food availability is reviewed in Section II. If the head of household is neither fully democratic nor fully altruistic, or else not fully informed about relative needs within the household, a selection of rice, farm, or all-portfolio activities that ‘optimised’ the combination of mean outcomes and downside risks for the head of household might be quite different from a selection that optimised for the household as a whole. As will be seen in sec. II.4, food and health-care allocations are adjusted away from vulnerable groups in times of crisis in some sorts of place and condition; towards them, in others; and neither, in most; and these places and conditions are not well correlated with those featuring, respectively, negative, positive, and zero discrimination in normal times.

All this renders CV-type measures of variation, while useful in risk and DF analysis, potentially misleading as indicators of income and consumption risk or DF. The sort of variations often associated with extreme vulnerability among the poorest, and forced sale of assets compelling descent into poverty [Jodha, 1990], are repeated downward fluctuations, especially those around a discontinuous ‘disaster’ level, and particularly if near the start of a sequence; such variations are in no way privileged above others by CV-type measures; and higher moments of a distribution, notably whether it is skewed, are in effect ignored. Yet most distributions of outcomes creating risk for decision-takers in developing countries, and sometimes making them vulnerable, are not normal or even symmetrical, and are not evenly

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<sup>27</sup> To keep things simple, assume all rice is consumed in the home, with no storage costs, borrowing, interest or trade. These would complicate the example without changing the message.

<sup>28</sup> This example concentrates on monetary risks to output, income or consumption; where the risk is to life, health or education, the concept of fluctuation ‘upside’ may make little sense.

<sup>29</sup> There is mixed evidence about whether the rural poor have a higher or lower share of non-farm income [FAO, 1998; Adams, 1994].

distributed over time (nor are the unevennesses similar across households, e.g. as between families at different stages in the life-cycle, or even within households).

The combination, in a measure, of timelessness and neutrality about the direction of small fluctuations vis-à-vis large ones, is in different ways a drawback when we use covariance as the measure of whether two sorts of risks are ‘worse’ - likelier to create vulnerability - because they are linked together.<sup>30</sup> A tendency to vary together in two sequences of outcomes - say net farm income from crops A and B in a year - clearly carries more ‘vulnerability’ if the two sequences tend to move together (a) when outcomes are below-average (unusually bad), more than when they are good (covariance-based measures do not allow for this); (b) when outcomes are extreme, more than when they are only slightly different from the mean (covariance-based measures allow for this, but maybe to a different extent than reflects relative disutility for the poor); (c) when bad (below-average), especially extreme, outcomes occur early in a sequence, and better outcomes late; (d) when bad outcomes, especially extreme ones, are bunched in time, rather than widely separated. Being time-neutral, covariance-based measures of concomitant variation systematically cannot allow for (c) and (d).

Even if this is not a problem, the use of CV as measure of risk is unappealing. The ‘safety-first’ measures of likelihood of disaster capture far better the concerns of the poor: both what harms them in bad times, and what makes them reluctant to adopt potentially disimpoverishing portfolios in normal times. Even if CV-type measures capture something of risks to income or consumption, they mean little when applied to risks of death, or loss of home due to civil war. Of course, even risk-of-disaster measures need not capture intra-household distribution, nor the extent to which disaster risk in one part of the portfolio is compensated by stability (or contravariance) in others; in discussing the evidence in section II we refer to these matters as appropriate.

In a few cases, safety-first (disaster avoidance) models have been tested against utility-maximising models, in which people are avoiding either downward fluctuations or all fluctuations. The results normally favour safety-first models [e.g. Shahabuddin and Mestelman, 1984, for Bangladesh], though often the downside-risk and standard CV-based (Pratt-Arrow) models cannot be discriminated by the data [Antle, 1988]. The Pratt-Arrow formulation, in which absolute risk aversion decreases as wealth rises, was found to be less important in Oyo, Nigeria, for farmers with more land and/or more income, and thus low or no relevant disaster risk [Adubi, 1996].

The inadequacies of CV-type models - time-independence, direction-of-change independence, inability to handle sharp changes or disasters – interact in many important cases of risk exposure and vulnerability (and probably therefore aversion) special to the poor. For example, there is a clear, sharp upturn in child mortality risk below the third or fourth wealth decile in all six developing countries with disaggregated evidence, and in four a further sharp upturn – a doubling or tripling – between the second and the poorest decile [Bonilla-Chacin and Hammer, 1999]. The probable cause is a level of household real consumption per equivalent adult below which there is a sharp rise in the risk of nutritional shortfalls sufficiently serious to raise the risk of death from childhood illnesses [Payne and

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<sup>30</sup> Word-fans will note how terms such as ‘covariate’ or ‘covariant’ risk, apart from correctly conveying the problem that risks may vary together, incorrectly yet elegantly insinuate that covariance-based measures are the ideal, neutral way to measure the severity of this problem

Lipton, 1994].<sup>31</sup> Child-specific, timing-specific and asymmetric disaster risk, surely a main problem for the world's poor, is not well captured by standard risk measures.

We have decided against trying to develop a single measure of the impact of risk, or DFs, on the poor, analogous to the alpha-measures of poverty (see Annex A). However, we have a preferred measure of risk itself - probability of falling below some defined 'disaster' level - though often the data compel us to use CV-type measures. We shall report, in section II, indicators, among poor and nonpoor, of exposure to such risks; of their correlations; of capacity for smoothing, by diversification or otherwise, to offset them; of vulnerability to basic damage from them; and of aversion from them, as it influences the profitability of activities.

### **I.5 Exposure, vulnerability, and aversion: why might the poor be different?**

We close the introduction by asking why, whether and how poor people might differ from the nonpoor in respect of DF management – e.g. reduction, smoothing, etc. – and hence DF and risk exposure, vulnerability, and aversion. Our aim is not to anticipate the evidence in Section II (about the interactions with poverty of the six main sources of DFs and risks: illness, violence, natural disaster, harvest failure, terms-of-trade deterioration, and loss of employment or self-employment), but to examine whether any such evidence casts light on the sorts of risk-related concepts and measures that are needed, if the interactions of risk, vulnerability and poverty are to be properly explored, and valid conclusions for anti-poverty policy drawn.

Section II will show that risk exposure is usually worse for the poor, but as was shown above (fn. 16) this is not always so. There is a classic identification problem. Usually, what is observed is the DFs and risks with which a person or household is faced – the upshot of risk exposure *and* risk aversion – so how do we decide which is responsible? Poor people are constrained to high risk exposure in certain respects, and this leads to surprising results. For instance, there is high concentration of the poor in drought-prone areas [Oram, 1988], yet economics predicts that people specialise – and reside - in areas of their comparative advantage, which should mean risk-taking in semi-arid places for the rich, and risk-avoiding (on tiny amounts of well-watered land elsewhere) for the poor. This happens less than expected, because for several reasons – low education, ethnic and language barriers, lack of contacts and capital, and risk aversion itself – the poor are relatively immobile out of such areas. Connell *et al.* [1976] showed that, while the poorest Indian villagers were prone to move as individuals in temporary search for extra labour income, they were less likely than others to engage in 'total household migration' to areas of new opportunity and comparative advantage.

There are several considerations that help to determine whether poor people are better, or worse, able to manage risk exposure by diversification into a range of activities with imperfectly covariant DFs. To assess this, we must recall that the distinction between covariate and idiosyncratic risk, so common in our analysis of the interaction between risk,

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<sup>31</sup> Pelletier [1991] rejects a threshold, but his diagrams and data show a 'logistic-shaped' relationship between anthropometric deficiency and child health/survival response, with a 'sharp' though not linear rise in the rate of increase of risk with deficiency at roughly the deficiency level where Chen *et al.* [19xx ] in Bangladesh, and other work, claimed a linear threshold. Whether there is a threshold or a 'sharp' inflexion point has little practical significance.

vulnerability and poverty, does not make sense without identification of (a) the type of risk, (b) the relevant reference group, within which risks may be either covariate or idiosyncratic. A household, especially if poor and thus likelier to lack food stores, savings, or borrowing capacity against bad times, is likely to be much affected by whether ‘bad times’ are the same for it and for other members of relevant reference groups: ‘relevant’ in the sense that the group, if it can, will support the stricken household.<sup>32</sup> The extent to which ‘it can’ will depend on who its members are - relatives, fellow-villagers, moneylenders, fellow-members of a caste or age-set, State insurers. The membership of the ‘support group’, as well as the set of DFs or risks to be supported, determines whether it can, and has incentives to, contract and in fact provide support for a stricken household or person.

The data compel us to rely on inadequate indicators. Covariance is an indicator derived from observations on paired observations at the same time, one from each data set (e.g. the poor household’s income and the rich household’s surplus), whether those observations are in good, bad or disastrous times. But we are really interested in the timed downward semi-variance, especially in times where households are near or below a threshold of adequacy: a requirements threshold for poor stricken households, a supportive-capacity threshold for others in the relevant reference group.

Within the reference group of villagers, over 70 per cent of variance in household income is idiosyncratic to individual villagers in Burkina Faso [Carter, 1991], Northern Nigeria [Udry, 1990], and South India [Morduch, 1991]. However, only in the last case is the information time-series and thus truly explanatory of risk exposure. In that Indian case, the proportion of variance that was idiosyncratic was considerably higher in the best-off, best-watered and lowest-variance village, Kanzara [Antle, 1989]. This seems likely to indicate a general rule: insurance, diversification, consumption borrowing, and other forms of consumption smoothing are most feasible where there is much the same idiosyncratic variation as anywhere, but less variation associated with events hitting the community as a whole – i.e. where there is less variation in income and welfare overall. Reciprocal altruism is also likeliest where there is not too great inequality, roughly similar exposure and vulnerability to DFs, and some enforcement mechanism.

These are fairly pessimistic conclusions for the scope of such smoothing mechanisms to help the poorest, because these are concentrated, *ceteris paribus*, in unequal places, and in places of high non-idiosyncratic DFs. However, broadening the scope and membership of support groups, and of smoothed activities, does give some prospect for better smoothing mechanisms. It is not clear to what extent market or state failure impinge on the prospects for this; we shall turn to these issues in section III.

We need to recall that not all diversification reduces disaster risk. This rose, alongside mean income, when Thai farmers diversified from rice into rubber-rice in the 1960s. Nor need diversification of all sorts reduce mean incomes, and its ‘discovery’ can raise these and reduce exposure to DFs, as in the case of some forms of intercropping in Burkina [Carter, 1991].

Given risk exposure and vulnerability, are the poor more risk-averse than the nonpoor, as theory suggests? There are three ways to find out: questionnaires about what people think about risk and how much they value its reduction; game simulations (which for ethical

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<sup>32</sup> Such support may be based on altruism, self-interested mutual support, custom, law, profit-seeking, and/or State-provided or mediated insurance.

reasons cannot have negative outcomes that would make the poor worse off than before the game); and inference from actual decisions, e.g. on the crop-mix. Moscardi and de Janvry [1977] and Hazell [1982] find moderate risk aversion, with little difference between poor and nonpoor.

Binswanger *et al.* [1982], using game simulations among South Indian 'ICRISAT' farmers, finds 34.8 percent slightly risk-averse, 39.8 percent moderately, 8.5 percent neutral, only 7.6 percent extremely risk averse (the remainder gave inconsistent replies because apparently unable to sense stochastic dominance). The poor were more risk-averse than others, but only moderately so; and, when payoffs rise and as experience was gained, there was convergence towards moderate risk aversion. However, methods other than game simulations revealed much more diversity in risk aversion than game simulations. Scandizzo and Dillon [1976], using questionnaires, showed poorer farmers clearly more risk-averse - and found a larger proportion of cases of extreme and zero risk aversion - than Binswanger *et al.* Antle [1987] observing field behaviour among ICRISAT villagers also finds more heterogeneity in risk aversion: the study does not report if the poor are more risk-averse, but Antle [1989] shows that the best-off village of the 3 studied (Kanzara) has much lower, indeed negligible, risk aversion. It may be lower poverty that is cutting risk aversion, or higher mean group income, signalling better prospects of mutual support.

Though absolute risk aversion probably rises with falling expected income over most of the range, it may not do so at the bottom. Shahabuddin *et al.* [1984] show that, in Bangladesh, the desperately poor may adopt 'gambler's throw' strategy because disaster is almost inevitable.

Risk aversion involves some apparent oddities, of special concern to the poor. First, it may impede 'risky investment in risk-reduction', such as digging wells where water is unsure [Binswanger *et al.*, 1982] as well as fertiliser intake; only if such investments are 'labouresque', needing slack-season labour of low opportunity-cost rather than cash or credit, are there are actually advantages to the poor. A further instructive oddity is that - though the poor's greater risk aversion renders them less likely than other farmers to use fertilisers when water adequacy is uncertain - they tend, if they do use fertiliser, to use more per hectare than other farmers [Binswanger *et al.*, 1982; Asaduzzaman, 1980], probably because of fixed transactions costs [Feder]. A further surprising area where farm risk aversion patterns favour the poor was observed in Madagascar by Barrett [1996a], who attributes higher yields on smaller farms to the fact that for food-deficit farms higher food output avoids price risks, while for food-surplus farms it incurs them.

Two final observations are needed regarding the interaction of risk aversion and poverty. First, farm and household characteristics (age, family size, farm experience, education) appear (as suggested by adoption research) to account for large parts of differences in risk aversion - e.g. around 70 per cent in Oyo, Nigeria, 1989-90 [Adubi, 1996]. However, many of these characteristics are closely related to poverty (family size) or lack of it (education) and are probably, in part, proxying its influence on risk aversion. Second, in the game simulations of response to risk, success (luck) in earlier games partly determines risk aversion later on (perhaps this is why aversions converge - luck does). If true that applies also to entrepreneurial, e.g. farm, experience and risk-taking, with the vital difference that farming luck or success builds up steady advantages in prosperity as well as in capacity to handle risk.

## II. EMPIRICAL EVIDENCE

### II.1 Risk of violence

The risk of violence includes the risk from wars, civil strife, crime and domestic violence. These occur at international (wars), national (civil strife), community (urban violence) and household (domestic violence) levels, and lead to increased poverty of the exposed groups of people. While every risk, if it actually takes place, becomes a riskless DF after the event and many do so well beforehand by ‘giving warning’ of their impending happening, violence differs in that it is most often unexpected until the last moment, otherwise it would be evaded. It is this intrinsic feature which makes social violence such as raids or street crime especially problematic for those exposed.

As indicated in Table 1, different groups are exposed to different types of violent situations. Most studies examining exposure to violence tend to focus on poor people, and poorer people, particularly lower income women who are victims of domestic violence, compared with their higher income counterparts, are more likely to report violence. Two recent studies have found that poverty levels are linked directly with exposure to violence and/or abuse. In a 12-month study of households in Santiago, Chile it was found that 46 percent of low income women were victims of domestic violence compared with only 29 percent of high income women on the sample. The same study carried out in Managua, Nicaragua put the figures at 54 percent and 45 percent respectively [Morrison and Orlando 1999]. Gonzales de Olarte and Gavilano Llosa [1999] also found that poverty increases the probability of sexual and psychological violence, but not physical. Morrison and Orlando also point out that abused women earn 35 percent less than their unabused peers in Santiago and 12 percent less in Managua. However, the direction of causality is not clear – does poverty trigger, or magnify, domestic violence or does domestic violence exacerbate poverty? Victims of domestic or social violence may be less productive on the job and be persistent absentees thus hindering labour market participation and increasing insecurity. There are intergenerational impacts too. Children who witness their mothers being abused at home perform badly at school and have higher repetition and drop-out rates which hinders their future ability to obtain adequate employment and a decent wage. They are more likely to live in poverty as adults than their peers [Morrison and Orlando 1999].

#### II.1.1 Extent and exposure to violence

Prolonged **wars** at international and national levels have devastating effects upon people’s lives and livelihoods. Both men and women are victims of war – whether directly as war fatalities or casualties, or through the effect of dislocation on their livelihoods and social networks. The impact of war on poverty can be difficult to assess. Reliable data tends to be thin on the ground – often records are destroyed or distorted as a direct result of the war – and data collection may become more difficult. Even if data is available, often it is purely at the national level that does not capture the economic and social effects of localised conflicts. Difficulties also arise when attempting to ascertain what might have happened had there not been a war. Many variables which appear to be a direct product of conflict, such as extreme income inequality, slow economic growth and agricultural production and little economic development, have also been robustly linked with incidence and severity of humanitarian emergencies [Nafziger and Auvinen 1997]. Although there are few data to establish clear

poverty links of the exposed population it is probable, given their limited chances to escape wars, that the poor are war's worst victims.

Up to the seventeenth century, young men were press-ganged into war service in England; we may be sure that the rich escaped. However, we should not underestimate the skills of people, including the very poor, in reducing risks due to war, e.g. by shifting plots away from roads frequented by predatory soldiers (seen by one of us in the former Zaire). Many ingenious forms of avoidance during the Thirty Years' War in Germany are recorded in literature, e.g. Brecht's *Mother Courage* and Grimmelshausen's *Simplicissimus*, but of course themselves carry costs of aversion. There is certainly a dearth of studies on meso- and micro-level impacts of war on vulnerable groups. In many cases, however, war has certainly accelerated the process of state collapse and this has disproportionately affected the poor [Luckham 1999]. A cross-national study by Mohammed [1996] found that increased military spending has tended to go hand-in-hand with reduced tax collection or a decline in GDP, or both, which implies a shrinking of social services budgets and hence entitlements of the poor.

In Sub-Saharan Africa most poor people live in rural areas. Therefore war/violence which impacts on agricultural production will also impact on poverty with a greater weight of the suffering being borne by the rural poor. The financing of the Ethiopian Civil War was ultimately through high taxation, compulsory quotas levied on agricultural produce and other interventions in agriculture. More than 90 percent of the population of Ethiopia in 1984 was living in rural areas and the overwhelming majority was peasants, therefore the costs of the war were imposed on the already-poor peasantry. Furthermore, these government interventions severely damaged market integration and reduced the ability of the rural economy to handle shocks which was a major contributing factor to the catastrophic effects of the 1984 drought.

In 1995 over 15 million people were international refugees unwilling or unable to repatriate, and in 1997-8 an estimated 20-22 million people were internally displaced due to conflict alone [USCR 1996; Global IDP Survey 1998]. Africa in general stands out on both issues, and within the continent the scale of the problem in particular countries is especially acute.

Overall, low-income countries have had higher incidences of wars (60 percent of countries) than lower-middle income (52 percent) and upper-middle income countries (35 percent). Within the "poorest" 20 countries with lowest per capita incomes, 40 percent have suffered major conflict in the last 25 years [Stewart *et al.* 1997]. This may be because as Collier has argued, low mean GNP cuts the opportunity-cost of soldiering and hence the wage that warring parties need to pay their soldiers. Wars cause dislocation of people (especially the poor and the under-resourced) thereby increasing their vulnerability to other forms of DFs and risks.

**Civil conflicts** have direct effects of mortality as well as indirect effects on welfare of the poor via economic changes at macro-, meso-, and micro-levels. Internal conflict (or, civil strife) has occurred more often in poor countries in recent times than international conflicts. Using data from a sample of 16 countries that experienced major conflicts during the 1970s and 1980s, Stewart *et al.* [1997] empirically investigates the economic and social costs of such conflicts. In general, macro-effects of conflicts include:

- decline in GDP per capita during the conflict period (in Mozambique and Uganda and falling at 4.4 percent per annum in Nicaragua),

- decrease in food production per capita (in Angola, Mozambique, Nicaragua and Somalia),
- decrease in value of exports (in Somalia at 16 percent),
- decrease in gross domestic savings ratio (in El Salvador, Ethiopia, Mozambique and Uganda),
- increases in budget deficits (in Mozambique, Nicaragua and Somalia at more than 15 percent of GDP),
- decrease in government expenditures as a percentage of the GDP (in Uganda), and usually
- increases in inflation rates (over 1000 percent in Nicaragua, and over 40 percent per annum in Mozambique, Uganda, Somalia and Sudan).

These macro-effects increase the vulnerability of the poor. At meso- and micro-levels, economies in conflict are characterised by urban concentration as rural migrants move to areas of relative peace [Green 1999]. There is consistent evidence of growth in informal sector activities in Mozambique [Chingono 1996] and Uganda [Green 1981] and the creation of small scale, informal activities as labour conditions usually worsen. Markets become segmented and forced migration leads to concentration of supply in some areas whilst shortages in others. Funkhouser [1997] confirms labour market shifts in El Salvador during the conflict of the late 1970s-early 1980s, concluding that there was a distinct effect on regional distribution of employment, a shift in economic activity from rural to urban areas, and significant levels of conflict related internal and international migration. At times of conflict, food markets become unstable because of large-scale looting. Moreover social capital breakdown results in a change from trusting to opportunistic behaviour. Thus, fragility of income (labour/food markets) is combined with fragility of social support networks to have a doubly adverse impact for low-income groups.

People are not always able to leave factional areas and therefore lose access to educational and medical facilities and are less easily reached by food aid. This has direct implications for both short-term and future poverty statuses. Likewise disruption of immunisation services. Even if people evade conflict through migration, livelihoods vanish and safety networks break down contributing to increased vulnerability and poverty.

Hard data is scarce and unreliable with respect to the extent of destruction of people's lives. According to the World Bank [1996] around 35 million people are currently displaced due to conflict and in some countries as much as 40 percent of the population is dislocated. Displacement often persists over entire generations and longer with serious long-term effects. In Uganda, for example, after decades of warfare former combatants and their families are a very vulnerable group. They demonstrate a lack of civic awareness, have low skill levels, meagre resources and are used to a culture of dependency. A veterans assistance board has been set up in order to assist the demobilised, but reconstruction often calls for skill-intensive labour which is not suitable for former combatants [Azam *et al.* 1994].

Within the household, women (and sometimes even children) are exposed to the risk of **domestic violence**. It is estimated that perhaps one out of every ten women in the world suffers such violence at the hands of her partner [UN, 1985a] although other studies imply that the rate may be higher. For Latin America, for example, arguably one of the world's most violent regions at home and on the streets, the figure for women experiencing domestic physical violence has been put at one to two out of every five [Morisson *et al.*, 1999]. There is little disaggregated information (income-wise) to analyse the extent of domestic violence among the poor. Poor women are the most commonly studied groups, so there is evidence

linking violence to this group of women, but this phenomenon is not confined to them alone. The level of such violence can be extreme (Table 2). All the same, women victims of domestic violence rarely seek help unless they are in extreme danger.

Often domestic violence towards women within lower income households is an indirect product of the household's survival responses to crises such as recession. Under these conditions, it is usual for the women to take more of an instrumental role within the household in organising strategies, such as increasing their labour market participation, in order to ensure the household's survival. Sometimes they have even supplanted men as the major income earners of the household. This undermines the role and security of men within the households with the result that males may be more likely to impose their authority or offload their frustration by physical force. Moser [1998] reviews several studies that show a direct link between decreasing male earnings and increasing domestic violence, usually alcohol-related.

In Mongolia women who divert time from household production into marketed labour are at greater risk of domestic violence [United Nations Development Programme, 1997]. Even when male labourers leave the household, migrating to secure work, long term split households may result in weakened relationships and thus marital conflicts which may especially affect children and lead to neglect with teenagers dropping out of schools or taking to drink [Moser 1998].

Close, causal links have been identified between domestic and social violence, with multiple effects on the economy. At the micro level there is a loss of productivity or wages of victims of violence. At the macro level, a society where violence is widespread gives out a signal of instability and therefore less attracts less foreign investment, has less savings and worse long-term growth prospects.

In some countries, an increase in observed **street violence** and crime has damaged social capital and cohesion at the community level. Over time, this may erode the stability of social support networks that are critical safety nets to low income groups in times of crises. Moser [1998] observes increasing levels of violence eroding social capital, by feuding gangs of armed robbers, burglaries, vandalism in urban centres of Chawama (Zambia), Commonwealth (Philippines) and Cisne Dos (Ecuador). Such behaviour is particularly characteristic amongst young males who, though perhaps already in vulnerable positions, further increase vulnerability in their environments. Those with higher incomes can protect themselves from rampant violence through private security. The poor, however, have to cope with high levels of crime and violence. [Buvinic *et al.* 1999] argue that fear of violence results in lower investment in human capital in that it induces some people not to invest in education, because of the dangers in attending night- school or studying after hours.

Urban violence, either deliberate or accidental, is bigger than infectious disease as a killer of children and adolescents. Violence (mostly murders) in Sao Paulo, Brazil in 1992 accounted for 86 percent of all deaths in males aged 15-19 years, and the death rate from murders for adolescent males from deprived areas was 11 times that of males from wealthier areas. Murder rates are three times higher in poorest zones than in richest zones of Sao Paulo. Death rates amongst black males in 1990 in Harlem (New York) meant that they were less likely to reach the age of 65 than males in Bangladesh.

Cain [1981] reports that in Char Gopalpur, Bangladesh, there was a higher probability of property being lost through expropriation or fraud by other villagers. Loss by fraud or force accounted for 14 percent of total amount of land loss in transactions as against 8 percent in the ICRISAT villages studied in India. This form of community violence leads to breakdown of social capital; thereby increasing the vulnerability of the poor and other socially excluded groups (such as women).

### II.1.2 Vulnerability to risks of violence

Amongst those who are exposed to various types of violence, some groups are particularly vulnerable.

**Children** - Angola, Ethiopia, Liberia, Mozambique, Somalia, Sudan, and Uganda have experienced rising IMRs in periods of conflict. Overall, low-income countries are the worst affected [Stewart *et al.* 1997]. In Sudan around 6.8 million people were estimated to be internally displaced in 1987-8, of whom 4.1 million were displaced due to war, and 1.8 million had migrated to Greater Khartoum in search of secure livelihoods [Elnur *et al.* 1993]. Spatial dislocation arising from wars and civil strife makes children particularly vulnerable to malnutrition. Luckham [1999] shows that war in Liberia has had geographically uneven impacts on child malnutrition rates, with considerable variations between regions as fighting shifted. Some regions experienced rates as severe as 60 – 90 percent. Disruption of education has far-reaching negative impacts in its effects on future employment prospects. Table 3 shows a range of values for anthropometry amongst different displaced populations in the Greater Khartoum area following civil strife and drought.

**Women** – Twenty-nine countries with conflict situations show decrease in ranking on GDI during 1970-1980 [Stewart *et al.* 1997] which suggests vulnerability of women. Poor, rural women in Sub-Saharan Africa are particularly vulnerable to conflict through large-scale disruption of livelihoods [Green 1999]. Crop destruction, killing of livestock, market disruption and forced displacement of farmers have an adverse impact on agricultural production and create periods of distress for women. A large number of Eritrean males from agricultural areas have been drawn into Eritrea's border conflict with Ethiopia, or have migrated leading to higher work burdens on women [Cliffe 1994]. Overall, a prolonged war creates a “general long-run decline in the resource base with increasing numbers of households drifting down from the middle peasant to the poor category” [Cliffe 1994]. Although female-headed households are typically a large, vulnerable group, war has a differentiated impact on women. In Uganda for example, the work burden for rural women has increased as they take on the extra burden of producing cash crops which was always traditionally the domain of the male, when the males of the household entered into combat. This constituted an increased work burden without a corresponding increase in societal status or control over productive resources. In Eritrea, on the other hand, conflict led to the establishment of formal women's political organisations and pro-poor policy [Luckham 1999].

In 1997-8 an estimated 20-22 million people were internally displaced due to conflict [USCR, 1996; Global IDP Survey, 1998]. This can sever household and family networks, restricting coping strategy options available to the poor and vulnerable groups. Women have been observed as being economically vulnerable in such situations as they lack support networks,

partners and combined with lack of education and few work skills find it extremely difficult to subsist.

Women in Bangladesh encounter various forms of violence; specifically, men's violence against women is widespread in the rural society [Arnes and Van Beurden 1977; White 1992; Zaman 1997]. The patriarchal ideology, i.e. women's absolute socio-economic dependency on men, makes them vulnerable to violence [Rahman 1999]. Contrary to expectations, the existing forms of violence (ranging from verbal aggression to physical abuse) seem to have increased as a result of micro-credit made available to poor, rural women through Grameen Bank and other service providers. It was hoped that channelling credit specifically to women by organising them into solidarity groups would lead to their empowerment and consequently to reduced domestic violence [Schuler *et al.* 1997]. Recent research [Rahman 1999] shows that women borrowers are particularly vulnerable to increased domestic violence as they try and maintain the inflexible weekly repayment schedule.

## II.2 Risks from natural disasters

This sub-section concentrates on evidence about DFs/risks of rainfall leading to droughts and floods. These are the subject of much of the disasters-poverty literature, and illustrate processes common to other DFs and disaster risks. The sub-section first explores the extent to which the poor are exposed to natural disasters and analyses the reasons (II.2.1). Second, we analyse the factors which make the poor more vulnerable (than the nonpoor), i.e. the poor-specific impact of natural disasters (II.2.2). Third, we examine the costs of risk aversion (II.2.3). Finally, we discuss the nature of covariance of disaster risks with other DFs and how that might lead to increased vulnerability of the poor (II.2.4).

### II.2.1 Exposure to risks from natural disasters

Significant advances in health, social and economic development are repeatedly interrupted by natural disasters (e.g. earthquakes, volcanic eruptions, windstorms, landslides, flooding, droughts, and forest fires). Furthermore there is mounting insurance evidence that in the last decade the frequency of natural disasters such as hurricanes and flooding has been growing, with an associated increase in costs and lives lost due to these disasters. Recent scientific research into self-similar probability theory, however, suggests that insurance companies have been basing their predictions on a model using incorrectly shaped bell-shaped curves which implies that in fact such occurrences are not necessarily more frequent per se, but more frequent than is being (inaccurately) predicted [Financial Times, 2/9/99].

These events cause DFs in people's consumption levels as they disrupt their livelihoods, destroy homes and often compel them to migrate to newer (and equally risky) dwellings. Health DFs resulting from the event include direct pain and misery, including death, direct costs of preventing, mitigating and coping with the disaster (such as treatment of illness and the costs of clearing up after a disaster such as earthquake), the opportunity cost of lost earned income, and costs of aversion – both from not exploiting areas which are prone to, say, earthquakes or malaria, and from being pushed by these risks towards less profitable portfolios overall.

On average, natural disasters are estimated to claim 25,000 lives and cause damage valued in excess of US\$3 billion every year [United Nations Environment Program, 1993]. Recent evidence shows an uptrend since around 1980. This cannot merely be put down to better reporting. There is a widely held view that Global Warming is increasing the occurrence of natural disasters e.g. El Niño. Developing countries, and especially their most densely populated regions, suffer the brunt of this. In 1970-85 they accounted for 97 percent of the world's 825 major natural disasters, and for more than 99 percent of all national disaster-related deaths [Abbott, 1991]. Between 1990 and 1992, in natural disasters causing over 30 deaths in developing countries, more than 500,000 people died, 80,000 were injured and 300 million were affected [United Nations Environment Program, 1993]. Bangladesh alone faced three storms, four floods, one *tsunami*, and two cyclones during this period, in total claiming over 400,000 lives and affecting a further 42 million people. The scale of setbacks caused by these events, especially to the poor highlights the need for long-term poverty reduction strategies to take into account the DFs caused by natural disasters.

Exposure to risks from natural disasters arises essentially from location, in addition to behaviour, e.g. strengthening flood barriers or buildings, plus behaviour-location interaction,

all of which are altered by development paths and policies. Certain countries are more prone to natural disasters than others. Table 4 depicts the extent of damage (as share of annual GNP) caused by natural disasters during 1970-89. Fourteen countries (of the 60 for which data is available) suffered damage worth more than 50 per cent of their respective GNPs. As they are lower income countries it is plausible that this takes up a good chunk of resources which could be put to use elsewhere e.g. improved public services such as health and education. Therefore the incidence of disaster and incumbent costs, because they form a higher proportion of GNP compared with richer countries, constitute an obstacle to human development. Within these countries, certain regions/cities are more exposed to natural disasters than others. For instance [Davies, 1986], several of world's fastest growing cities have histories of exposure to severe tropical storms - Karachi (Pakistan), Jakarta (Indonesia), Calcutta (India) and Dhaka (Bangladesh). Countries with high rural populations and land and income inequalities<sup>33</sup> have concentrations of people in high-risk coastal zones (e.g. Philippines, parts of Indonesia, the Sundarbans). Table 5 provides a snapshot of major cities that are at risk of natural disasters. At the same time, urban poverty is also a determinant of people's exposure to natural disasters.

Hardoy and Satterthwaite [1989] provide examples of urban settlements on hillsides at risk of landslide in Rio de Janeiro, Guatemala City, La Paz and Caracas, and of land prone to flooding in Guayaquil, Recife, Lagos and Port Harcourt, Port Moresby, Delhi, Bangkok and Jakarta. In urban areas the poor tend to be both more at risk and also more vulnerable to disasters [International Federation of Red Cross and Red Crescent Societies, 1998]. As cities grow out of safe sites i.e. as the population can no longer be contained in relatively safe areas, for the most part lower income groups cannot afford the safer, well-located sites. Whole communities become concentrated in areas at risk of floods or landslides. Furthermore, those with higher incomes often have the advantage of insurance to help balance the short-term advantages of living in a risk-prone area against the longer-term risk. This risk disparity between high and low-income groups means that poorer communities bear most of the hazard costs. In addition to being 'forced' into relatively more risk-prone locations, urban disasters impact more greatly on lower income groups in the following ways. First, they tend to lack the good housing, infrastructure and services that reduces the human effects of the disaster. Second, lack of land rights, for example shantytowns, means that authorities can refuse services and infrastructure to illegal settlements. Lack of secure land rights also means there is little incentive to make adaptations to dwellings so that they are more able to withstand damage. When their homes are destroyed, poorer people often lose their most valuable asset and even their means to make a living if they lose tools and materials. Little resources are left for recovery.

There is also evidence that vulnerable groups such as low-income communities get the least help following a natural disaster. Following the 1997 Acapulco Hurricane the response to the disaster was concentrated in the hotel/tourist areas rather than the hillside settlements where the service workers lived even though mudslides and floods had destroyed their homes. [International Federation of Red Cross and Red Crescent Societies, 1998].

In Indore, India, the state system of compensation for flood damage has acted as an unintended incentive to low-income households to build houses in high risk areas on land near the city centre next to small rivers which act as storm drains [International Federation of Red Cross and Red Crescent Societies, 1998]. These areas are very desirable in that they are

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<sup>33</sup> That is, a high proportion of land and income accruing to smaller proportion of the population.

close to jobs and markets, have good access to public services, the land is cheap and it is publicly owned so that there is no risk of eviction. It is this security of 'tenure', coupled with the perception that flooding is a natural, seasonal event (and as such not a DF) which leads the community to make both temporary and permanent flood adaptations to their dwellings. They perceive the advantages of this location to far outweigh the risks of flooding. Low-income groups, therefore, will invest time, effort and funds in reducing their vulnerability to disaster if they are sure they will not be evicted.

So while *prima facie* residence in risk-prone regions/cities exposes all to the risk, (i) the nonpoor are less likely to be living there, and (ii) their exposure arises from quality of housing, access only to marginal lands, limited access to markets, poor quality of livestock, etc. (Table 6) – factors that are direct correlates of poverty itself. That is, the poor are often located in risk-prone regions.

At first glance, this might appear to run contrary to the fact that the poor are more risk-averse than others - being more vulnerable to a given risk, and less able to avoid consumption declines in the wake of lower incomes or extra costs following a disaster. How do we explain the apparent paradox that the poor nevertheless 'choose' to expose themselves to a wide range of natural disasters? They adopt a risky package of behaviour in face of disaster risks – seen as low and/or very hard to manage and/or the will of God – in order to survive; to do this, they reason,<sup>34</sup> they are constrained to accept some disaster risks, so as to reduce what are perceived as more manageable and likelier income/consumption DFs. The poor are often constrained to work or live in conditions carrying very high risks, not only of natural disasters, but from unhealthy garbage dumps, polluted air and water, etc. Constrained to accept high-risk exposure to such risks, the poor are then likely to be more averse to extra risk/DFs within those constraints.

## II.2.2 Vulnerability to natural disasters

Vulnerability of the poor to natural disasters arises from a combination of factors. Land pressure combines with their type of livelihoods to increase their vulnerability.

Low-income families living in squatter settlements are particularly vulnerable to natural disasters [Davies, 1987]. Given existing rural resource inequalities (land, housing, etc.), migrants move into already overcrowded cities. Urbanisation is often a result of migrant response to rural disasters. In a household study of the urbanisation process in Dhaka, Shakur [1987] showed that most Dhaka squatters are rural destitutes who either migrated in response to bad economic conditions (37 per cent, especially the landless) or were driven out by natural disasters (26 per cent) such as floods, cyclones and famines.

Because of land pressure, migrants are forced to occupy unsafe land [Havlick, 1986]. In Philippines they live in poorly constructed squatter settlements on stilts at the edge of the water, and in low-lying flood plains and wastelands. In Manila 35 per cent of the population lives in squatter settlements (66 per cent in Calcutta) which makes them (the poor) vulnerable

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<sup>34</sup> Reason, feel, learn, or 'act as if' they did these things. See Shahabuddin *et al.* [1984] for evidence of analogous high-risk behaviour by the very poorest in farming decisions in Bangladesh.

to DFs/risks of coastal flooding and cyclones [Donohue, 1982]. The poor are then susceptible to risks from natural hazards, in addition to the more 'every-day' risks of malnutrition and poor health [Richards and Thomson, 1984; Pryer and Crook, 1988].

In rural areas, land pressure leads small farmers and indigenous people, like Palawans (in Philippines), to retreat further into steep mountain regions. Clearing new land and then trying to farm there, puts them at risk from typhoons. Torrential rains cause landslides which silts rivers downstream, increasing the risk of floods on the coast and in urban slums.

The 1977 cyclone in Andhra Pradesh (India) resulted in mortality rates of 23-27 percent among small farmers, fishermen and marginal farmers, but only 3-4 percent among large farmers and petty officials in the affected areas. The latter group (nonpoor) was less vulnerable to the cyclone because of their ability to speedily evacuate by road, the type and strength of their houses, and the small variations in topography in their residential locations [Winchester, 1986]. Vulnerability is also a function of the household's ability to recover from repeated DFs. Winchester [1986.] investigated rates of economic recovery by 1981 amongst 6 occupational groups exposed to the 1977 cyclone. After 4 years, large farmers who lost most had caught up and were better-off than the pre-1977 levels. However, marginal farmers, fishermen and landless labourers had found it difficult to achieve pre-cyclone welfare levels and were struggling at near the poverty threshold. Jodha's study of the 1962-3 drought in Rajasthan [Walker and Ryan, 1990] reported farmers' response to and the consequences of severe drought. He noted that small farm households in particular relied heavily on wages from public relief works to supplement or as sole income following harvest failure resulting from drought. Larger farmers, on the other hand, sold their assets. The resulting situation was one of higher food prices, falling asset prices (with the exception of goats), and a deleterious impact on human capital formation. This had a far-reaching negative impact on the ability to gain employment and make a living in the future, and thus on poverty levels, as 42 percent of children no longer attended school.

Based on longitudinal data for 100 Burkina Faso households in 1983-4 (normal year) and 1984-5 (severe drought year) from ICRISAT, and 400 Ethiopian households in 1984-5 (severe drought year) and 1988-9 (normal year) from IFPRI, Webb and Reardon [1992] found that even in drought years, the richest households had much higher crop yields than the poorest. It is possible that the rich-poor difference in yields may be due to cropping mix since the yields of sorghum and maize, generally cultivated by richer households, were more drought-resistant than millet which tends to be grown by poorer farmers. Cow milk yields in Ethiopia for the richest group were unchanged by the drought at five litres per day through the use of purchased feed, but for the poorest group, milk yields fell from five to one litres per day. Differences between the poorest and richest income terciles in the impact of drought are revealed in Table 7 in terms of crop yields, output and prices received (as implied in \$ crop values). It is evident that: (i) against normal years, the reduction in yields in drought years amongst the poorest was not much different to that of the richest; (ii) nor was output much different therefore, in comparison to normal years; (iii) the richest in Sahelian Burkina Faso and Upland Ethiopia appear to have been protected better from crop price variations than the poorest (compare rich-poor cuts in output, with rich-poor cuts in \$ crop value).

Barrett [1996b] demonstrated with a simple two-period model of agricultural households both producing and consuming under price uncertainty at the time when labour allocation decisions were made, that 'non-degenerate' land distribution coupled with price risk can lead small farmers to produce more (as net deficit farmers) and big (food surplus) farmers to

produce less. He showed that where small farmers are unable to out-bid large farmers for land due to constraints from land and credit market failures, food price risk induces small net deficit farmers to use labour beyond even their shadow valuation of labour, whereas large food surplus farmers will cut down on the use of costly inputs. So, dependent on endowments, identical risk exposure can generate different behaviours.

### II.2.3 Costs of risk aversion

Poverty and distribution costs of natural hazards depend on the distribution of access to social- or self-insurance against those risks, and these can be revealed *ex-post* by changes in household income sources, which differ across agroclimatic zones.

Reardon and Taylor [1996] use the ICRISAT Burkina Faso panel data on rainfed agropastoralism to chart the changes in poverty and inequality after the drought (Table 8). Income inequality decompositions for a normal year and drought year show that all income sources are unequal and favour richer households (except that transfers in the Guinean and Sahelian zones, were roughly inequality neutral). No income sources were unequal and favouring poorer households. This is shown in Table 9 which gives values for the product of the income source Gini and the Gini correlation between the income source and the distribution of total income – this takes values between 1 (when the income source is unequally distributed towards the rich) and minus 1 when the income source is unequally distributed towards the poor.

In this study, off-farm income is amongst the most unequally and rich-favouring source, indicating the poor have limited opportunities to diversify incomes even in these very uncertain agro-climates (although the drought seems to reduce some of the advantage the rich enjoy in the normal year in the Sahelian and Sudanian zones).<sup>35</sup> This indicates the income of the poor is tied strongly to crop income and they have few options to diversify, especially in the more drought prone Sahelian zone. The impact of the drought on income by sources for poorest and richest terciles is also given, and shows the markedly different coping strategy of the rich and poor as they adjust their income portfolios in response to changing opportunities (Table 10).

Intuitively, it makes sense that high asset households, generally those with higher incomes, are more able to diversify into more capital intensive activities both for the expected income and for risk motives. However, evidence for this is very mixed. Reardon and Taylor [1996] found, in a study of Northern Burkina Faso, that non-farm incomes had an unequalising effect leading to a more unequal overall income distribution between higher and lower income households. For Southern Burkina Faso, however, they found the reverse to be true and non-farm incomes had an *equalising* effect. Lanjouw and Stern found, that non-farm income

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<sup>35</sup> *Gini elasticities of off-farm income in normal and drought years for the Sahelian, Sudanian and Guinean zones are all inequality increasing (respectively 0.18, 0.22, and 0.13 in normal year, and 0.13, 0.14, 0.19 in drought year), and of crop income are inequality decreasing (-0.23, -0.27, -0.11 in normal year, and -0.10, -0.16, and -0.18 in drought year). Gini elasticities for other sources are all under 0.10 and mostly inequality increasing, both in normal and drought years. The FGT squared poverty gap rises as a result of drought in the Sahelian zone (0.02 to 0.19) and Sudanian zone (0.12 to 0.15), but not the Guinean zone (0.01 to 0.01). The elasticities of FGT squared poverty gap with respect to different income types are: (i) zero for migration and transfers (except for transfers in Sudanian zone, -0.07); (ii) above -1.5 for crop income; (iii) between -0.21 and -0.54 for non-farm income; and varied widely for livestock income (-0.77 in Sahelian, -0.07 for Sudanian and -0.41 for Guinean zone).*

had strongly unequalising effect in Palanpur, Uttar Pradesh for 1983-4 but an equalising effect in the same zone 2 decades previously. Data for Rural Thailand [FAO, 1998] gives a more unequal income distribution for farm income than for income 'from all sources', again suggesting equalising effects of off-farm income.

#### **II.2.4 Covariance of disaster risks with other DFs**

Not all crises become disasters. A disaster is defined as "a crisis that outstrips the capacity of society to cope with it" [Anderson and Woodrow, 1991]. A major risk in the wake of disaster is famine, as people can lose their entitlements to food completely. But not everyone suffers equally in a disaster and some do not suffer at all. Payne and Dugdale [1977] have reported that 'the success of some agricultural communities in adapting to sharp seasonal stress depends on their capacity to deposit and release a high ratio of fat to lean'. People who store excess food in good times as fat rather than muscle fare better as fat is easier to mobilise at low health cost in hard times than muscle. Other communities who tend to lose weight with a high lean content become emaciated. There is some evidence that in areas of high fluctuation fat-storers have been selected over the generations, while muscle-storers dominate areas of low mean and low fluctuation.

Rather than simply food risks, primary health risks are of greater concern for excess mortality in famine conditions. During the period of starvation, health risks rise, especially in the last stages of famine when already weakened people migrate to famine camps with generally poor health environments. These constitute a major mortality risk. In this case, feeding centres by concentrating ill people may contribute to morbidity and mortality, unless an integrated health and nutrition program is implemented.

Based on a study of famine in Darfur, Sudan, de Waal [1989] argued that interventions in famine situations should not simply *provide* food, but help people to do the sorts of things which let them *acquire* food. As factors other than lack of food are the main killers in famine, public health interventions, such as clean water, sanitation and vaccination, both before and during food crisis may be the single best set of interventions to prevent excess mortality. "The principal way to save lives during famine, and also to prevent much undernutrition, is to supply health security. These health security [public health] interventions can be started well in advance of any impending famine, and will benefit the population in normal times as well. If they are implemented in western Sudan, it is likely that future famines will pass off with greatly reduced excess mortality or no excess deaths at all, irrespective of other interventions, including food relief" [de Waal, 1991].

Floods and tidal surges are major natural hazards for the poor in Bangladesh. After floods, the poor are more exposed to health risks than the nonpoor because of:

- (i) loss of dwelling, and so have to sleep in the open;
- (ii) shortage of food;
- (iii) breakdown of tube-wells leading to shortage of drinking water;
- (iv) lack of toilet and washing facilities;
- (v) shortage of firewood or fuel, especially limiting options to boil water for drinking;
- (vi) infection from corpses and carcasses in the flood water; and
- (vii) mental stress in dealing with prolonged adverse situation.

Islam [1997] analysed the link between floods and increase of health risk in Bangladesh. In the years when there were major floods (1984, 1987, 1988 and 1991), the incidence of measles was above the 1981-93 time-trend by between 6-90 percent (depending on year); malaria was below the trend by between 13-33 percent (except for 1991); and an aggregated figure for incidences of diarrhoea, cholera and dysentery was above the trend by between 20-124 percent (except for 1984). Health expenditures in one provincial town (Tangail) averaged over six months prior to and six months after the flood in 1988 show that:

- (i) the increase in medical expenditures is highest in the poorest income group,
- (ii) the poorest continue to spend a larger proportion of their income on health, this health-income proportion rises due to the flood, as it does in other income groups (Table 11).

To date, there has been little discussion on effects of macroeconomic policies on vulnerability to disasters. Ford [1987] has analysed the link between vulnerability and the global economy in Jamaica. The government intervened in the financial sector as a stabilisation measure and interest rates rose to more than 20 per cent and home mortgage rates to 14-25 per cent. At the same time, the government enforced rent control and put an import duty on residential construction. Thus, there was an immediate decline in building maintenance and a rise in low-cost building construction, which made people, especially the poor, more vulnerable to hurricanes and earthquakes. The government's own programmes for disaster preparation and mitigation were also cut. While the inter-relationship between macroeconomic policies and disaster risks is not clear, it is plausible that the damage caused by hurricanes Gilbert in 1988 and Hugo in 1989 was magnified by such policies involving all-round spending-cuts encompassing disaster relief or building maintenance. Incidentally, part of the reason why Jamaica launched the SAP in the first place was because of foreign debt burdens resulting from loans for previous hurricane damage.

Similarly, while countries must sustain macroeconomic adjustment for long-run growth (and therefore poverty reduction), a coincidental disaster can significantly raise the burdens on the poor and complicate public policy against poverty. Zimbabwe's poor faced a double crisis in early 1990s when public policy changes via the Economic and Social Adjustment Programme (ESAP) 1990-4, combined with the widespread drought in 1991-2. Under Zimbabwe's ESAP, health user fees were introduced at a time when resources were redirected towards the drought relief programme. Real expenditure in health was cut by a third between 1990-4, when health demands might have been expected to be great. Employment was affected both by drought-related reductions in production, public sector freezes under ESAP, and declining real wages under labour market deregulation under ESAP. Crop failure from the drought was followed by price rises – removal of staple food subsidy under ESAP was delayed until 1993. Public spending, and relatedly, inflation targets were not met at least partly due to extra public expenditure in drought relief. Thus, overlapping covariant DFs had a devastating impact on the poor.

## II.3 Harvest DF/Risk and Seasonality

The causes of harvest-related damaging fluctuations are many. Some are due to biotic reasons, such as: pests, fungi, viruses, bacteria, nematodes; animal and human predators; human or animal labour availability and capacity; or price fluctuations that do not match the fluctuations in agricultural requirements. Other fluctuations are due to abiotic causes, especially rainfall quantity and/or timing. Such causes differ by their predictability. Some, including seasonality, are predictable (at least in occurrence, though not always in magnitude). Others are unpredictable, and are true calculable risks or totally random events. The more unpredictable the event the greater the damage, and therefore addressing damaging harvest fluctuations should focus on turning unpredictable events into calculable risks, and risks into predictable fluctuations. But the poor and the remote tend to have less access to information on the best rainfall and pest forecasts, and are less able to bear the costs of reducing damaging fluctuations even if fully predictable – costs ranging from irrigation to appropriate pest control.

### II.3.1 Exposure to Harvest DFs/Risks and Seasonality

Exposure to the risk of harvest shortfall depends on wealth, gender and primary economic activity of the household. Damaging fluctuations in crop output impinge more on poor people, and especially the rural poor, than on nonpoor. Even within an area, the poor and nonpoor may differ in farm-location, in terms of riskiness and scope for managing seasonality. Anand and Bhalla [1981] claim that small landholdings tend to be on better and more reliably watered land in India, which would suggest less exposure to seasonal as well as risk-related damaging harvest fluctuations. A study of deep tubewells in ninety villages in Bangladesh found that large farmers ensure that a greater proportion of their land within the potential command area receives water, but small farmers still do relatively better from the wells because a higher proportion of their land is in the potential command area, and they use more high yielding varieties [Aeron-Thomas 1992]. In this study, small farmers operating under 2.5 acres obtained nearly half the incremental income from deep tubewells – and via wages, the landless obtained 16 percent of the incremental income, which was almost the share obtained by medium and large farmers. Aeron-Thomas (1992, p.10) explains the large share of benefits obtained by small farmers with that fact that although large farmers obtained water for a large part of their land which fell within the irrigated potential command area, they also had substantial land *outside* the command area. In other words this was due to locational reasons, and less a result of equity in water allocation practices, and this would concur with substantial evidence which finds that water allocation practices are generally to the advantage of the nonpoor.

In other places (e.g. South Africa) the poor have very much less chance of their land being irrigated than non-poor, and where available the irrigation technology may be less assured and fluctuate more closely with rainfall (viz. tank versus tubewell). Also if Oram [1988] is right about crowding of the rural poor into marginal, semiarid, and hilly areas, this would outweigh any tendency for them to have more reliably watered land in any given type of agro-ecology. Inclusion in irrigation development may also be gender determined, as shown in studies of irrigation projects by Koppen [1998] on Bangladesh and Burkina Faso, Casey [1991] on Indonesia, and Hulsebosch and Koppen [1993] on Kenya. Gender may emerge not only in terms of access to water, but also access to information and extension services, and

also control over production decisions and produce in the context of changed cropping patterns as a result of irrigation.

Damaging fluctuations influence production choices and outcomes, in terms of area planted, crop-mix, crop-specific yields, and crop output – and analogously so for animal products. As evidenced by Richards [1990] in Northern Nigeria, farmers may respond to an uncertain start to the rains with replantings (several times), and with adjustment of the crop mixture and spacing. But poor farmers may be hampered by shortages of seed and labour. Once a bad year becomes apparent, farmers may shift the emphasis of cultivation to another agro-environment – but this strategy requires extra land, which is harder for the poor to obtain. Combining animal husbandry with crop farming offers other options for addressing harvest fluctuations. In drought prone parts of Karnataka in India, Pasha [1991] finds that 36 percent of total gross income of small and marginal farmers (those with less than five acres of dry land, or 1.5 acres of irrigated land) is accounted for by animal husbandry, and half of that from small ruminants, like sheep and goats – in contrast crop cultivation contributes 41 percent of total gross income. Sheep and goats can survive on dry grass, thorns and bushes which are not used by any other animal and in turn contribute milk, wool, manure, skin, and cash to the household economy. Small ruminants may be critical for liquidity in times of crisis, but able to withstand harsh environments, they also may be important avenues for saving up towards larger animals. In some part so Africa livestock often may be owned by women. However, such animal husbandry by resource-poor farmers relies heavily on common property resources – if these get stressed and degraded, as is often the case, the rich may diversify away but the poor are left with few other options.

As usual, unpredictability, sources, strains, stresses and damage are more serious if correlated among types of DF, and among persons in a given DF. Rain problems tend to cause damaging fluctuations in all crop and animal products, but with different extents and timings. On the other hand pest problems usually affect only one or two farm-product output levels, unless the pests are human/ draught-animal bacteria, (rather than crop/milch-cattle pests) which might decrease human labour supply to all farm activities. Monocultures are especially vulnerable, exemplifying the importance of diversification of income sources. In some cases this source of reduced DF-vulnerability may be at the expense of specialisation and output, and in policy terms this may conflict with agricultural liberalisation objectives. In other cases, diversification via crop rotations and crop mixing, increase sustainable output and its growth, as well as reducing crop DFs.

Temperature, rainfall, and photoperiod (day length) vary seasonally. Developing countries lie in the lower latitudes, i.e. tropics and subtropics, which are areas with relatively more stable seasonal temperatures and photoperiod – but also more unstable rainfall [Gill 1991]. Nutritional well-being has three seasonally varying determinants: food intake, nutrient requirements, and nutrient wastage. The pro- or counter-cyclical nature of variations across the seasons in these three factors is important. The coincidence of low food intakes and high nutrient requirements is greatest and more severe in areas with a unimodal rainfall pattern, for here the onset of rains signals a rush to prepare the land for the next agricultural cycle at the same time that food supplies from the previous harvest are approaching exhaustion [Gill 1991; Longhurst 1986]. The poor are more exposed to this because their initial post-harvest food stocks are smaller [e.g. Chen et al. 1979], their own body reserves of fat are lower [e.g. Stini 1988; Dercon and Krishnan 1999], they are employed to perform the most arduous agricultural labouring, and they own fewer labour augmenting assets, such as plough teams. The seasonal nature of diseases and pests, such as guinea worm, malaria, respiratory

problems and gastro-intestinal conditions, mean nutrient wastage is also seasonal – in general the rainy season is identified as the most difficult, and this often coincides with nutritional stress. But important variations exist across and within countries where seasonal cycles in nutrient intakes, requirements and/or wastage may be counter-cyclical across the seasons, underlining “the dangers of unthinkingly extrapolating findings about seasonality from one area to another” [Gill 1991:51].

Household reproduction obligations, which usually fall on women and girls, may be seasonal, such as obtaining water in the dry season and dry fuelwood in the rainy season. Pregnant and lactating women require more nutrients which may go especially unmet during seasonal scarcity. Lawrence et al. [1987] find both mother and infant anthropometry in The Gambia to be the lowest towards the end of the hungry season, which also coincides with the heavy agricultural workload. In many places, fertility appears to be seasonal – for reasons like seasonal migration, taboos on intercourse during certain times of year, festivals, work demands, and adverse climate – and evidence from a number of countries suggest that seasonally varying health and nutrition risks may coincidentally peak just when the infant is neonatal and/or weaning, the very two periods when a person is most open to death [Gill 1991].

### **II.3.2 Vulnerability to Damaging Fluctuations**

The vulnerability of people to harvest fluctuations depends on the consequences of these fluctuations for their consumption per equivalent adult. This is related to:

- exposure to stress, in terms of size, frequency, and bunching;
- initial level of consumption, and consumption smoothing;
- share of farm output in determining consumption; and
- covariance or contravariance of farm output and farm prices.

#### ***Size, frequency and bunching***

It may be argued that in many contexts seasonal hunger and famine are merely points along a continuum, rather than distinct events, since it is found that often the early stages of famine are no different than a ‘bad year’ [Richards 1990]. The size, frequency and bunching of damaging fluctuations determine whether people move from coping with hunger in an average bad year to something more severe and chronic, i.e. from bad to worse. Numerous studies show that the poor often have to cope with a series of events, rather a single one. Chen [1991] found that the risk of food insecurity was anticipated and household strategies were carefully planned accordingly. First, alternative income sources were sought which did not disturb the subsistence base of the household. This was followed by austerity measures coupled with increased reliance on credit and the exchange of food, then temporary migration for employment. The second stage of the strategy involved the sale or mortgage of productive assets. Longhurst (1986) also found that poor rural families plan for food shortages whether due to seasonality or unexpected inter-seasonal events. Household food strategies involve production adjustments (namely diversification, growing root crops, livestock, bush collecting), social adjustments (reciprocal economic exchange, gender-linked allocation of farming tasks, varying modes of household integration) and biological strategies (drawing on body-fat stores and/or changing diet composition). He found that in Northern Nigeria coping strategies tended to proceed through the following stages: i) changes in cropping pattern ii) drawing on stores and assets iii) developing and exploiting social relationships, iv)

diversification of off-farm income opportunities. Under drought in Zambia in 1991/2, Kajoba [1998, p.197] writes “people resorted to survival strategies which included eating honey mixed with soil, wild fruits, wild roots, and drought resistant foods”.

### *Initial level of consumption and consumption smoothing*

People with low levels of initial consumption have more problems in paying costs of cereals storage or getting credit to smooth consumption; a given farm-output fluctuation is larger as a proportion of initial consumption, and is likelier to carry across the basic-damage threshold; they have fewer options to access informal social support; and are also located in remote and isolated environments, where markets do not exist or work imperfectly, and in these contexts the costs of harvest fluctuations are amplified.

Damage is likely to be more to food consumption among children since they are over-represented amongst large, poor households, and because they are more vulnerable than adults to irreversible harm from even short-term shortfalls in food intakes, especially if they are already initially underweight. There is little evidence showing that the poor discriminate against children any differently than the nonpoor. But in South Asia prevailing norms imply that girls – especially later-born girls – are discriminated against, and are most vulnerable during stress [Behrman 1988; Behrman and Deolalikar 1990; Rose 1995; Haddad et al. 1996].

Another reason why the poor’s consumption may be more vulnerable to harvest fluctuations is that poor households possess fewer assets that may be liquidated in times of crisis. Households identified as particularly vulnerable are composed of many small children or elderly, or households facing a major life cycle event, e.g. death of a productive member, or meeting marriage expenses. Though the poor focus their strategies on protecting productive capacity, a series of damaging fluctuations may exhaust all other coping options. Jodha (1990) found that even very poor households in Rajasthan, when facing one-off unexpected damaging fluctuations, radically cut consumption to maintain assets, and only in the second year of harvest failure do such households normally choose to erode their very limited capital base. When disposing of assets the poor may be disadvantaged, as shown by Riely [1992] in the Sudan, as they have a weaker ability to time sales in relation to market conditions; worse health of livestock; and weaker ability to protect the herd, for example by buying fodder. During drought there is usually a severe deterioration of the terms of trade between livestock and grain. Fafchamps [1998] in a study of West African households in semi-arid tropics found that livestock transactions compensated for 20-30 percent of income shortfalls due to income shocks. Sales of productive assets commonly shift the household towards chronic poverty. Thus variability in income and consumption may diminish through successive DFs as livelihoods get decimated. Davies [1996] found this when examining the ability of households to deal with drought in the Inner Niger Delta: “the ability of livelihood systems to accumulate during good years, and the sequential options this provided for meeting successive dry years and recovering from them, has been replaced by a cycle of subsistence and coping in each year, such that accumulation is rarely possible and food stocks are restricted to a few months’ supply at best” [p.168].

Harvest fluctuations are different from other DFs because of their covariate nature. The poor are unable to smooth consumption by borrowing, since local relatives, traders and moneylenders, are likely to be impoverished too at the same time when the demand and price of credit rises. This makes the case for diversified national or even international financial

sources – so lenders, or migrated relatives, are not resourceless at the same time as poor would-be borrowers. For those who can access it, purchase of food on credit from traders is a common way to reduce vulnerability to food shortage caused by harvest failure. But a harvest failure or seasonal downturn in one year may worsen subsequent downturns because reserves of food and cash run out in the lean season sooner than normal. This can increase the vulnerability even of nonpoor groups.

### *Share of farm output in determining consumption*

Diversification of income sources may be achieved through both on- and non-farm activities. Though the poor may have strong incentives to diversify, they also have limited opportunities for doing so. Often diversification suggests that households accept lower income for greater security. But quite a lot of on-farm diversity, such as via mixed cropping and field fragmentation, take advantage of complementarities between crops, variations in soil types and differences in micro-climates that ensure risk spreading with little loss in total income [Ellis 1998:13].

Within an on-farm diversified portfolio, income sources will still be correlated, and so diversification into non-farm sources is important. All the same, diversification itself may be risky and costly – for example Dercon and Krishnan [1996] find high entry barriers to non-farm activities in Ethiopia and Tanzania, and Sakurai [1997] found assets allowed households in the Sahel to take riskier decisions. Thus the capacity to invest and retain a diversified portfolio may be related to household wealth. Reardon et al. [1992], using panel data from Burkina Faso, find that land increases household investment in non-farm activity, and the latter is negatively related to both income and consumption variability – this was especially true of zones facing greater damaging fluctuations. At the regional level, average non-farm income shares are higher in East and Southern Africa (45 percent), than Latin America (40 percent), West Africa (36 percent), East Asia (35 percent) and South Asia (29 percent) [FAO 1998: 290]. These averages mask considerable intra-regional variations in shares, with richer countries showing higher shares and levels of rural non-farm income. Evidence on the relationship between the share of non-farm income in total household income, and the level of total income or size of holdings is very mixed, with some places showing negative relationships and some positive [FAO 1998:316]. But there is a better case, though still mixed, for saying absolute non-farm income is positively related to income levels (even if shares are not).

The effectiveness of various non-farm incomes to protect consumption from damaging fluctuations varies: farm-wage income is likely to vary with own-farm production more than local non-farm wage or self-employment incomes. And rural industries may be even more counter-cyclical [Ellis 1998]. Studies also show that where the agroclimate is unfavourable households tend to earn more from migration than from local non-farm activity [FAO 1998]. Diversification into the dynamic, less-village-specific, less local agriculture dependent subsectors (like rural trade, transport, shops, cafes, and especially construction) is likely to make the best contribution to raising household mean income and lowering vulnerability to a given exposure to farm income DFs.

### *Covariance or contravariance of farm output and farm prices*

The general tendency in large or remote markets to contravariance does not help the many vulnerable farmers who have bad output results when their neighbours have good ones (and

hence low prices) – nor does it help those whose output in a bad season falls far more than national output. Liberalisation, globalisation, and lower ratios of transport cost to production cost, are delinking national shortfalls in output from high national prices that once compensated rain/ pest-struck farmers. With general labour surplus any such compensation would not necessarily have been passed on to farmworkers – who are normally poorer than farmers; thus lost employment due to pest/ rainfall situations would not be compensated by higher wage-rates even if the price of the crops produced did rise to compensate farmer-employers. Above all, for net food buyers – who are a growing majority of the urban poor, and in Asia and Latin America also the rural poor – ‘high prices in years of low output’ are the cause of strain from these DF-stresses, not its alleviator.

### **II.3.3 Risk aversion**

Poor people engage in a number of risk averse behaviours in anticipation or response to harvest fluctuations. Are poor farmers forced into a particular crop choice to avoid harvest fluctuations? There is mixed evidence. Cropping patterns, in terms of timing, technology and composition, are not fixed and vary with ex ante assessments of climate and other factors. In Northern Nigeria, Longhurst [1986] and Richards [1990] conclude that there is an adaptive flexibility in cropping patterns that enables risks to be spread in response to crop failure due to uncertain rainfall. Longhurst found that a seasonal food strategy for the poor involved planting sorghum rather than millet even though millet matures earlier in order to free up their time to work as farm labourers to get cash for food before harvest. Richards [1990] reports similarly for Sierra Leone.

Rice farmers in the ICRISAT villages in South India have been shown to use more labour than would be called for on the grounds of profit maximisation alone. On average, their labour use implies a relative risk premium of 14 percent of expected net returns [Antle 1987]. Alternatively, inputs may be used less intensively as a way of reducing the level of investment tied up in risky activities. Bliss and Stern [1982] in their study of Palanpur in North India find that while fertiliser is a highly productive input in wheat cultivation, its marginal product is 3.5 times its price. Farmers could raise expected profits by increasing fertiliser application, but by using less fertiliser, they can cut their losses in bad times. The foregone expected profits are most plausibly explained by high levels of risk and risk aversion. Similarly Moscardi and de Janvry [1977] also point to high risk premia in explaining low fertiliser use in corn cultivation in Puebla, Mexico.

Binswanger and Rosenzweig [1993] examine the effects on farm profits as a whole of increasing the coefficient of variation of rainfall timing by one standard deviation. For a household with median wealth levels, farm profits would be reduced by 15 percent, but for the bottom wealth quartile, income smoothing would reduce farm profits by 35 percent. On the other hand, households in the top wealth quartile have adequate ways to cope with DF/ risk, and increasing riskiness has little impact on the profitability of the richest farmers. Thus, inability to cope with adverse shocks can exacerbate already wide inequalities.

Rainfall timing is crucial and households often postpone making investments until they have better information. Once it is known that weather will be poor, households may choose to limit production to cut potential losses: as a result the variability of area cultivated has been found to be higher than yield variability in the ICRISAT area [Walker and Ryan 1990]. While it may help smooth income, waiting to obtain better information can be costly. In Palanpur,

delaying the onset of production by two weeks can reduce yields by 20 percent [Bliss and Stern, 1982]. Similar types of trade-offs are described by Fafchamps [1993] in his investigation of sequential aspects of uncertainty and labour supply in Burkina Faso.

Households facing greater volatility in farm profits are also more likely to have a household member employed in steady wage employment [Rosenzweig and Stark 1989; Kochar 1992; Rose 1994].

Peasant communities in the dry zone of Sri Lanka employ such risk-averting strategies as not using costly inputs or expensive management practices, engaging in dry sowing, poor weeding, low levels of fertiliser application, inadequate disease and pest control. Risk aversion behaviour also affects the choice of cultivar [Arachchi 1998]. Failure of the monsoon in 1995 and 1996 led to long drought spells. The 1996 statistics indicate that nationwide crop production was severely affected with a drastic fall in output of coconut and other food crops. In the eight locations studied, Arachchi [1998] found that agricultural income had declined substantially, leading to increased indebtedness for 80 percent of households. Harvest failure, despite the risk-aversion behaviour and coping strategies such as household rationing of food intake, the use of food reserves, and sale of assets, had long-lasting effects on nutritional deficiencies and related diseases. Labour quality was weaker among household members and 30 percent of households reported increased incidence of family illness during 1996-7 drought.

## II.4 Health DFs/risks

The poor are exposed to different, and in some respects more serious, illness, injury, and consequent costs. These costs are of four main types (a) *utility cost* - unpleasantness of being ill: pain, discomfort, lack of information and foreknowledge, at worst death; family distress; (b) *direct cost* of prevention, care or cure, (c) *opportunity cost* of lost labour income, education, etc. while ill, (d) *aversion cost* to the well, from lost income due to reluctance to work in places thought to be exposed to river-blindness or sleeping-sickness, to adoption of low-risk/low-return portfolio due to fear of illness).

Some conditions are 'equal-opportunity diseases', such that exposure, vulnerability and/or aversion are largely independent of poverty. The first section of this discussion reviews poverty-specific differences in risks and DFs – conditions that affect the poor more seriously just because they are poor (II.4.1). In section II. 4.2, we review conditions that affect the poor differently because of their different demographic structure: many problems are special to particular physiological groups, especially infants and females. In reviewing differential health DFs by age and sex, intrahousehold variation in risk exposure and vulnerability will be explored. Third, the poor may suffer different health risks due to their different residential (rural-urban) or occupational groups, or because they are migrants, who are exposed and vulnerable to special types of risks (II.4.3). Fourth, DFs in health and illnesses may vary *among* socio-economic groups of the poor, such as slum dwellers, squatters and other urban poor (II.4.4). The final section (II.4.5) will discuss the nature of covariance of health risks with other DFs and how that might lead to increased vulnerability of the poor.

### II.4.1 Illness/injury/death risk specially affecting the poor

Does poverty expose its victims to particular types or levels of health risks? Using the household outlay per adult equivalent consumer (HOPAEC) to assess a household's poverty, Payne and Lipton [1994] investigate whether there is a level of HOPAEC such that below it there is a substantial risk that energy intakes are so seriously below requirements as to lead to severe anthropometric shortfalls - and hence to major increases in risk of reduced mental or working capacity, of illness, or even, among pre-schoolers, of death?

Behrman and Wolfe [1984] observed an extremely weak positive relationship between nutritional intake and HOPAEC in Nicaragua, but a highly significant positive relationship between mother's education and nutritional demand. Lipton [1983] reports of several microstudies and surveys in which the income (or expenditure) elasticities of demand for food within ultrapoor households are not significantly below unity. So long as HOPAEC remained below a critical level, these households reduced neither the proportion of outlay devoted to food nor the staples-food ratio in spite of increase of total household income and outlay. These findings are confirmed by both Edrisinghe and Poleman [1983] and Bhanoji Rao [1981]. More recently, Subramanian and Deaton's [1996] investigation of nutrition and expenditure in rural Maharashtra in India estimated the elasticity of calories consumption with respect to total expenditure as 0.3-0.5, declining only slowly with levels of living. As HOPAEC rises above a critical level, households diversify food consumption beyond basic food staples. In general, over the whole income range, the relationship between HOPAEC and energy acquisition per adult equivalent consumer is weaker than that which holds for the ultrapoor.

There is much evidence to support the assertion that there are major linkages between poverty and health. According to The World Health Organisation, of the total population of 540 million people in LDCs, 350 million live in poverty, particularly those in rural areas [Carrin and Politi, 1997]. Coupled with high incidents of poverty is a marked difference between life expectancy levels and mortality rates between these countries and the industrialised world. Children suffer in particular with 30 million reported to be dying from malnutrition each year in LDCs [Carrin and Politi, 1997]. Carrin and Politi [1997] performed a simple calculation comparing deviations from expected life expectancy of 10 selected countries and compared 'high' performers (i.e. those with higher than expected life expectancy given their GDP per capita) and 'low' performers with their respective levels of both total and rural absolute poverty. The 10 countries below the expected life expectancy rate have an unweighted average of 55 percent of the population below the absolute poverty line compared with 36 percent of the population of the ten best performers. Furthermore, 61 percent of the population in rural areas live in absolute poverty in the 'low' performer countries compared with 45 percent in the 'high' performers.

Poor people tend to spend a greater proportion of their income on food. For example, the estimated average for Sierra Leone is 70 percent [Carrin and Politi, 1997]. The poor also tend to have less assets and little or no access to credit. These factors, combined with disproportionate food expenditure are directly linked to greater exposure and vulnerability to health risk of lower-income groups. Even small negative income variations can suddenly reduce food availability especially if there is no access to savings or credit. Inadequate food intake is the main cause of high rates of infant and child mortality. Poor nutrition means that the individual is more susceptible to illness and/or less likely to make a speedy recovery. Labour productivity is also lower so the individual tends to be less able to hire out their own labour leading to a further decline in their economic situation. It follows therefore that better availability and consumption of food leads to better health for the poor. For the poor in rural areas, access to healthcare is often problematic due to living in isolated areas, illiteracy and shortage of time especially during peak seasons such as harvesting. The opportunity cost of seeking care may be too high.

#### **II.4.2 Illness/injury/death risk specially affecting the poor because of their age/sex structure**

There are numerous examples of gender biases in intrahousehold resource allocation. Separate evidence exists on (a) nutrition bias, (b) healthcare-access bias. The only conclusive evidence is for biases against girls aged 2-4 in N. India, Bangladesh, Pakistan, one case in Philippines and some in N Africa/W Asia. Such **gender biases** drive a wedge between the relative levels of risk exposure (or vulnerability, if it's health-care bias) of females and males, within the same household. Pro-male preferences in nutrition, health, education, rest and leisure, etc. imply greater risks for women for a number of different risk types. For example, it might be supposed that women's health is at greater risk because male health and nutrition expenditures are prioritised within the household. An as yet unsolved question is whether such gender biases (and hence the risk-wedge) are greater or less in poor households. In other words, are poor women subject to greater risk than nonpoor women arising from greater biases in intrahousehold resource allocation in poor households? Alderman and Gertler [1997] provide some evidence on decreasing bias in health expenditures with income levels in Pakistan. Behrman and Deolalikar [1990] highlight the pro-male bias in semi-arid North India in cushioning nutrition from price and income shocks. Of the total interpersonal

variance in nutrition in a sample, intrahousehold variance accounted for between 15 percent and 48 percent depending on the nutrient. Moreover, selective female exposure appears to worsen in times of greatest danger; food price elasticities for women and girls are more negative or less positive than men or boys, suggesting that when food prices rise, the nutrient intakes of women and girls are adjusted downward by more than the household average.

In South Asia the lower status of women is reflected in poor female nutrition levels making women more vulnerable to disease. In India, among the poorest castes as many as half of females but only 14 percent of males have body-weights 70 percent or less of expected weight [Momsen, 1993]. Men are also more likely to receive medical treatment when ill.

According to a recent UN document [details to be provided] survival of girls relative to boys has worsened in the past 25 years. The female mortality disadvantage is greatest in South Asia, and less so (and with greater intra-regional variation) in North Africa and Western Asia. Elsewhere the evidence is less clear-cut at a regional level. Girls and boys differ in terms of their exposure to risk from infection or other life-threatening hazards if their activities differ, they are supervised differently, or if different standards of hygiene are imposed on them. Resistance to infection differs between sexes due to genetic differences (especially in neonatal mortality), vaccination, diet, prior morbidity and sex-biases in birth spacing.

There is evidence from Somalia [Aden *et al.*, 1997] that mortality risk over the life-span has gender differentials. Women have relatively lower mortality risk than men during infancy and childhood but the risk increases during the women's reproductive period. In South Asia, divorced and widowed women are vulnerable to higher mortality risk especially in Bangladesh [Shaikh, 1990] and India [Drèze, 1990; Chen, 1991] where they are denied access to their husbands' property.

Often **children** in poor households are exposed to greater health risk than adults in the same household in urban areas because of:

- increased diarrhoeal risk due to water shortage and contamination,
- earlier exposure to measles due to cramped housing conditions,
- undernutrition, and
- risks of accident and injury.

In particular, infants in urban slums suffer increased exposure to health risks. The infant mortality rate (IMR) in slum areas of Port-au-Prince (Haiti) was 20 percent, which was three times that of urban areas; in Quito (Ecuador) it was around 130 and in other parts about 4 per 1000 live births; in Porto Alegre (Brazil), the numbers were 75 and 25 per 1000 live births, and in Cape Town (South Africa), 40 and 8 per 1000 live births [Brockerhoff, 1995; Tabibzadeh *et al.*, 1989].

Rates of mortality of 6-36 month children, stunting, wasting and diarrhoea are worse in smaller urban centres compared to the major city, worse for the lower socio-economic classes<sup>36</sup>, and worse for the worst environment class<sup>37</sup> [Timæus and Lush, 1995]. For example using DHS data, rates of mortality per 1000 were 1.5 times in the poorest socio-economic

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<sup>36</sup> The socio-economic classes are disaggregated on the basis of husband's occupation, schooling, and consumer durables owned by the household.

<sup>37</sup> The environment categories have been disaggregated on the basis of water supply, sanitation and housing quality.

class than in the richest in Ghana, 5 times in Egypt, 13 times in Brazil, and 3 times in Thailand. This research finds that mortality of children of urban poor often as high as that of rural children, with environmental conditions as well as socio-economic status affecting children's health. The size of intra-urban differentials in child health vary greatly between countries reflecting both overall national income and particular histories of economic and urban development.

Two counter-intuitive results show that growth status of **street children** may not be much worse than other poor groups. The Nepali study compares street boys in Kathmandu, with middle-class boys going to a fee-paying school in Kathmandu, poor boys from squatter settlements around Kathmandu, and rural boys from a remote village a full day's walk from the nearest market town. The street children showed little impaired growth than squatters or rural boys, for different age groups 6-14 years, and for different duration of street life [Panter-Brick *et al.*, 1996]. The Jakarta study on street children [Gross *et al.*, 1996] found that more than three-quarters of the children maintained regular contact with their family, and most had at least one biological parent at home. A large proportion are stunted – about 52 percent of children have low height-for-age – but this is related to early and chronic development. More relevant to immediate status is wasting, and only 7 percent had low weight-for-height. Comparison with a reference population from a slum area in Jakarta finds wasting in the street children to be lower than in the slum.

This may be because:

- street children have better control of resources and so are better fed than siblings at home;
- the stronger and physically fit children are the ones on the street (natural selection), since street life is tough;
- moving children onto streets is part of household risk management strategy, and at least for nutritional objectives seems effective;
- favourable nutritional status leaves out significantly raised risks to long-term child development

#### **II.4.3 Illness/injury/death risk because of other relevant structures special to the poor**

Recent research [Brockerhoff, 1995] suggests that **rural to urban migrants**, particularly the children of women who migrated from rural to urban areas before the early 1980s, are exposed to greater health risk than the children of urban non-migrants due to direct effects of their rural origins, and indirect effects of their belonging to low socio-economic groups in the urban area.

Analysing data from Demographic and Health Surveys, Brockerhoff [1995] found that in terms of under-five mortality, migrants in urban areas are strongly disadvantaged in Latin America, moderately disadvantaged in North Africa, and appear to be no worse off in sub-Saharan Africa (Table 12). Urban migrants in capital cities of Africa and Latin America are more exposed to health risks as they were found to be more likely than urban natives to live in dwellings without electricity, flush toilet, or piped drinking water, in non-durable housing and to own no major consumer durables. Pooling data for all countries for samples from largest city, smaller city, town, and rural village, indicates that:

- the higher infant (0-15 months) and child (16-59 months) mortality rates in urban households of migrants compared to non-migrants is due to migrants who have lived in

urban areas for over ten years – these more established migrants experienced 40 percent higher risks of both infant and child mortality than natives, thereby refuting the hypothesis that over time behaviours and conditions of migrants converge with those of natives;

- this mortality risk disadvantage holds if the sample is disaggregated by largest city, smaller cities, and towns, though the increased chances of infant and child mortality amongst established migrants relative to urban natives is slightly less in towns;
- There is no evidence that younger, more recent migrants from rural areas have higher child mortality risks than urban natives.
- infant and child mortality risks in rural populations are greater than in both urban migrant and urban natives populations– rural populations have 55 percent (infant) and 130 percent (child) greater risks compared to the pooled sample of urban natives and recent urban migrants, and 14 percent and 100 percent greater risks compared to established migrants; in other words, chances of dying between one and five years are more than doubled in rural areas;
- Factors such as durable rather than earthen flooring, or piped water supply, or flush toilet, or electricity, or a television each significantly reduces the risk of mortality during infancy, compared to not having them. The availability of potable water and flush toilets each reduce the risk of dying after infancy by almost 50 percent. Notably neither maternal nor paternal education have effects; also even controlling for these socio-economic factors, the effect of migrant status remains but at a reduced level - compared to urban natives the extra chances of mortality is over 20 percent for infant mortality and over 40 percent for child mortality.

#### II.4.4 Differences among poverty groups in health risks

The urban advantage - in which urban averages generally indicate better welfare conditions than the rural areas - is misleading and inappropriate as a guide for national health strategies, as it obscures enormous differences in health status and risks of ill-health among and within urban areas [Brockerhoff, 1995]. Mortality<sup>38</sup> and morbidity amongst **urban poor** are worse than that of the urban population as a whole. Poor people tend to live in over-crowded housing with little sanitation leading to higher prevalence of disease compared with higher income urban dwellers. It is in rural areas, however, where the majority of impoverished people live in developing countries, that the exposure to health risks is greater. Housing conditions are often worse in rural areas than in urban areas. Poorly ventilated houses lead to higher incidents of respiratory disease and cooking indoors leads to chronic lung disease such as bronchitis. [Momsen, 1993]. Intra-urban distribution of access to health care is usually less unequal than intra-rural. Urban teaching hospitals, often catering to many poor people, absorb the lion's share of health expenditures, leaving little for even the most basic rural health, sanitation and clean water. This selectively and hugely disadvantages and raises risk for the rural poor.

Tabibzadeh *et al.* [1989] identified three main groups of health risks among **slum-dwellers and squatters** in a number of developing country cities. These were risks related to:

- low sanitation, low quality housing and overcrowding, and undernutrition;
- the urban environment, like industrialisation and work conditions, pollution, traffic, and stress; and

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<sup>38</sup> The commonly used mortality indicators are the crude birth and death rates, infant mortality rate and the under-5 mortality rate.

- urban sociology, such as loss of extended family protection, side-effects of alcohol and drugs abuse, prostitution and sexual disease, and personal security.

These risks combine to raise the burden of not only communicable disease, but also chronic disease amongst the poor. For instance, the incidence of tuberculosis infection in slums in Abidjan (Côte d'Ivoire) was 3 percent, higher than the average of 2.5 percent for Abidjan as a whole and twice the national average of 1.5 percent [Tabibzadeh *et al.*, 1989].

#### II.4.5 Covariance of health risks with other DFs

Whether a household is resilient to health risks – especially to their effect in reducing earned income – depends in part on whether they are covariate with other, current or immediately prior, DFs or risks. Often health crises follow and amplify other social stresses at both societal and individual levels. The major cause of fatality in the Darfur famine in the mid-1980s was a series of epidemics, resulting from the concentration of people in areas without adequate sanitation and clean water [de Waal, 1989]. The outbreaks aggravated the effort to recover from the initial setback. Households in ICRISAT villages can compensate for effects of illness in slack agricultural seasons, but if illness occurs in peak season, a high loss of wage income ensues, especially if a male falls ill. For small farms especially, which tend to have fewer male workers than larger farms, such illness may impact more on income variability and subsequent poverty than yield fluctuations due to the high cost of coping with such a shock, invariably involving resorting to costly informal borrowing [Kochar, 1995].

Ill-health can reduce returns to investment in human capital. Malnutrition and poor health interferes with schooling and makes expenditure on education less productive [Behrman, 1996; Miller, del Roso and Marek, 1996]. Both the society and the household bear a high cost with the premature dropping out of a skilled worker from the labour force because of ill-health.

Most severe stress to households is often the loss or illness of the major income earner [Noponen, 1991]. For poor households with little or no savings to fall back on, a lack of surplus of daily income over needs and fewer assets the impact is particularly acute. Pryer's [1989] work in Khulna, Bangladesh, confirms the importance of illness as a source of shock within households. Fifty-three percent of households are totally dependent on a single worker [NIUA, 1989]. Thus unemployment, disability, illness or death of this worker can be crucial to the economic survival of the household, so that the risk of a severely malnourished child coming from a household with an incapacitated earner is 2.5 times greater than those without [NIUA, *ibid.*]. An important implication of this with regards to vulnerability to a given health risk is that exposure tends to be much greater in single-earner households, and therefore in recently formed couples with 1 or 2 small children, highlighting the significance of household demographic structure.

Data from ICRISAT villages shows that illnesses are important contributory factors to DFs, especially for the poor, with 28 percent of large farm households having illness amongst working members over year as against 43 percent for other households.

Size of the DF is important, i.e. a small fluctuation in terms of a few days or weeks of earnings lost to illness, can be mitigated whereas a larger idiosyncratic health shock (or one enduring long term) is more difficult to bear by households. As Gertler and Gruber [1997]

find, with respect to health fluctuations in Indonesia, households can sufficiently insure against approximately 70 percent of moderately sized undesirable health fluctuations. However for DFs causing longer term serious impairment, their consumption levels are only protected by about 30 percent. This confirms Lund and Fafchamps' [1997] findings in rural Philippines.

## II.5 Labour Market DF/risks<sup>39</sup>

### II.5.1 Introduction

A discussion of ‘the poor’ and ‘the labour market’ is meaningless without acknowledging the heterogeneity inherent in each of these. Studies show that some labour market-related risks are more damaging to the poor than to the non-poor and more damaging to certain sub-groups of the poor than to others. Of particular interest, in terms of vulnerability, are the young, the old, and women and children. Before delving into how these various categories of the poor react differently to labour market related DFs, it may be useful to recognise the role of membership to different employment categories.

Harris *et al* [1990: 638] argue that “labour status is the single most important factor for determining poverty”. In their study of the labour market in Coimbatore, India, they divide the labour market into the following categories: protected regular wage, unprotected regular wage, unprotected irregular wage, capital-owning self employment and marginal work. Only 3.6 percent of households employed in protected regular work fell below the poverty line. In contrast, unsurprisingly, 52.5 percent of households employed in unprotected irregular wage work fell below the income-defined poverty line. The figures for independent wage work, self-employment and marginal work are 38.9, 19.5 and 44.5 percent respectively. Evidence from Honduras using the 1993 Household Survey (EPHPM) shows that poverty incidence was highest among domestic workers (96.3 percent), co-operative, collective or group workers (65.5 percent) and own-account workers (31.8 percent) and lowest among salaried workers in the public sector (3.1 percent) [Thorpe 1996]. Earlier empirical evidence shows that in Jatoba, Brazil, in 1983, 16 percent of protected workers were poor as compared to 52 percent of unprotected workers. In Costa Rica, 75 percent of households in the bottom decile were working in the informal sector as against 32 percent of non-poor households [Rodgers 1989]<sup>40</sup>.

This disaggregation yields some insight into the DFs. It helps to distinguish general economic changes and consequent labour market fluctuations that *push* workers into independent wage work, self-employment and marginal work (collectively referred to as the informal sector), from those risks that adversely affect the poor specifically once they gain membership to these categories. Examples of the former include the growth of increasingly capital and skill-intensive industries and structural adjustment programs (SAPs). Stagnation in formal employment in Latin America as a result of shrinking public sector policies has led to a sharp increase in informal employment corresponding with an increase in urban poverty as lower middle class households fell below the poverty line [CEPAL 1991].<sup>41</sup> This phenomenon is distinct from the poor-specific effect of this aspect of a SAP. The DF is still a decrease in employment in the formal sector, affecting the more highly educated middle class. But almost universally, the first to be retrenched are the low-skilled workers who dominate the urban poor.

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<sup>39</sup> Contribution of Loraine Ronchi and Julie Litchfield in the preparation of this section is gratefully acknowledged.

<sup>40</sup> "Informal units comprise small enterprises with hired workers, household "enterprises" using mostly family labour, and the self-employed" [ILO 1998:167].

<sup>41</sup> In 1996, the proportion of urban employment falling into the informal sector was 57 percent in Bolivia, 53 percent in Colombia, 48 percent in Thailand (1994) and 57.5 percent in Madagascar (1995) [ILO 1998: 167].

A further distinction must be made between labour market *reactions* to non-labour market related DFs and those actions of the poor that indicate exposure, vulnerability and aversion to labour market related DFs. For example, family member participation in the workforce may increase as a result of inflation (the capital of the self-employed is usually kept in cash and thus real income deteriorates with high and rapid inflation). The same reaction may be provoked by the death of the principal income earner in the family, but in this case the reaction is more relevant as it is in response to a labour market related DF.

The following sections will discuss the exposure, vulnerability and aversion of the poor and in particular, certain subsets of the poor, to idiosyncratic DFs such as the loss of employment due to specialisation or the death of a primary income earner, or to covariate DFs, such as an increasing in the demand for skilled labour or a decrease in formal sector employment following an SAP or a financial and production crisis. In measuring these phenomena, the unemployment rate will only be of limited use since the employment base endogenously changes as the poor react to DFs in large numbers. The considerable size of the informal sector further diminishes the importance of the unemployment rate.

## **II.5.2 Exposure to Labour Market DFs/risks**

DFs in the form of contractions in labour demand in the formal sector, induced by SAP policies or financial crises restricting investment and production, affect the poor more adversely than non-poor households. In Latin America in the 1980s and early 1990s, "...the proportion of total earnings represented by salaries and wages [...] declined in the majority of urban households in the region. Conversely, the proportion of earnings represented by wages for independent work...increased. These changes are especially noticeable in the poorest households" [CEPAL 1991, in de la Rocha 1995:18]. The virtual halt of investment and production in the recent Asian crisis has had a similar effect. After the contraction of labour demand associated with the crisis, the wage differentials between the formal and informal sectors in Korea widened after a period of pre-crisis narrowing. The higher exposure of the poor as compared to the non-poor to labour demand contractions in both instances is to a large degree due to the predominance of the poor in low-skilled employment. The effect is two-fold: increases in demand for skilled labour worsens the labour market exclusion of the poor and a lack of skills training tends to place the poor in heavily cyclical sectors like construction.

Exposure of the poor as a group to contractions in formal sector labour demand, is a direct consequence of their low skill status, low levels of education and the subsequent lack of access to regular, secure work. In a recent [1998] study on training and the labour market, the ILO recognises the social and economic forces that reinforce exclusion of the poor in this regard. Remaining in the informal sector subjects the low-skilled poor to asymmetric responses to the business cycle. In OECD countries, "...for all low-skilled workers a 1 per cent contraction of the economy in recession years increases unemployment levels by almost 23 per cent, while a 1 per cent expansion of the economy during recoveries lowers unemployment levels by less than 5 per cent" [ILO 1998: 165]. This pattern may well be true for developing countries. The typically low wages of the informal sector<sup>42</sup> contributing to low

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<sup>42</sup> There is an acknowledged heterogeneity in the informal sector with small or micro enterprises economically stronger, household based employment constituting unpaid family labour and the low wage independent service subsector of domestics and shoeshine boys [ILO 1998: 168]. Exact data on the wage differentials in these

family income necessitate early exit from formal schooling. Furthermore, the lower returns to investment in skills in this sector ensure that the poor are particularly exposed to DFs related to increases in demand for skilled labour.

Much of this analysis is also relevant to the rural poor. In response to contractions in crop demand and/or seasonal unemployment, many members of rural agricultural households migrate, permanently or temporarily, to urban areas. In Indonesia, 44 percent of rural households are engaged in rural-urban migration. The corresponding proportion for Malaysia and the Philippines is between 19-30 and 47 percent, respectively. Labour from rural areas is largely unspecialised and unskilled, exposing them to the same risks as the urban poor, outlined above. Labour market related DFs particular to the rural poor arise when crop prices drop too low to motivate further efforts. For example in September 1999, the price of arabica coffee fell below the cost of production for farmers in Costa Rica. In this instance, due to a lack of resources and/or information concerning crop diversification, the rural poor depending largely or wholly on their coffee harvest for survival find themselves without remunerative employment [Ronchi 1999].

Women, as a subgroup of the poor, suffer from a particularly high exposure to labour demand DFs of all varieties. In Korea, women tend to work for small firms that are disproportionately affected by the crisis [Horton and Mazumdar 1999: 9]. Furthermore, the perception of women as temporary workers and secondary earners leads to their early retrenchment in times of fluctuating labour demand. Another explanation for this intense exposure to labour demand DFs lies with commitments to child rearing which lead employers to invest less in job-training and skills provision, placing women more firmly in the category of the unskilled workers due for early retrenchment. Unsurprisingly, compounded with the large wage differentials between women and men, households headed by women are concentrated at the lowest levels of income [de la Rocha 1995: 22]. Studies on reduced labour demand subsequent to the Asian crisis confirm that in those countries where women face lower relative wages and are viewed as temporary workers, as in Korea, Malaysia and Indonesia, this phenomena is particularly acute [Horton and Mazumdar 1999]. Women's exposure to labour demand contractions is exacerbated by the very coping mechanisms adopted by governments, namely investment in labour-intensive public works projects, which tend to be more beneficial to men than to women. Finally, women in non-female headed households are exposed to a DF such as the loss of employment or death of the principal income earner.

Labour DFs also affect the young disproportionately. Unemployment rates among those aged 15-19 years old in Greater Buenos Aires reached 30.5 percent in 1994, compared to rates of 8.1 and 9.4 percent among those aged 35-49 and 50-64 respectively [Marshall 1998]. Increases in the demand for skilled labour, among the poor, affect young workers in particular. Lower levels of education among the poor in general are compounded for the young by a lack of work experience and on-the-job skills acquisition. When increased demand for skilled workers coincides with a general contraction of labour, the unskilled and inexperienced young are doubly exposed.

### **II.5.3 Vulnerability to Labour Market DFs/risks**

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subsectors is not available, but the levels of insecurity and depressed wages are sufficiently present in all three as to refer to them as a group.

Many factors explaining the relatively higher exposure of the poor to contractions in labour demand in the formal and informal sectors, relate to their vulnerability as well. Upon early retrenchment, re-employment is difficult in the absence of skills and the correlated lack of access to formal and protected employment markets. It has already been established in II.5.1 that the poor dominate the informal sector. The informal sector is also characterised by high numbers of low-education workers: in Thailand in 1994, 87 percent of workers in the informal sector had primary school or less compared to 48 percent in the formal sector (including government) [ILO 1998:171]. A DF such as the increase in demand for skilled labour, coinciding with poor economic growth, leads to unemployment and underemployment for the poor. They are particularly vulnerable due to the institutional and economic barriers to the acquisition of skills. Here membership to a category of the labour market is once again important. The low wages earned in the informal sector in turn depress family income and prevent investment in skills and education as family members are required to enter the workforce as soon as possible. They do not possess the resources to manage the DF even if it were perfectly predictable.

Within the poor, certain groups are more vulnerable than others to labour market related DFs: namely, migrant workers, young families and women and children. Migrant workers invariably fall in the low-skilled category. In Malaysia, where 20 percent of the workforce is composed of foreign migrant workers, the impact of the Asian crisis was particularly onerous. Horton and Mazumdar [1999] cite longer hours, worsening housing provision and forcible redeployment or repatriation when work visas were not renewed. Those who remained illegally suffered a further worsening of work conditions as their status went from protected (legal working status) to unprotected. However, as wage and employment costs decreased, this led to the retrenchment of nationals in favour of migrants. The results are therefore mixed. Internal migrants are similarly more vulnerable than are non-migrant workers in urban areas for many of the same reasons, including low levels of education and skill. Those migrants termed 'permanent' are particularly vulnerable to labour demand DFs as they have relinquished claims/ownership/access to their land, whereas temporary migrants can still return to the rural areas from which they came. Although temporary migrants (rural poor) are therefore less vulnerable than permanent migrants (newly urban poor) to contractions in labour demand DFs, their migration took place in the first place in an effort to diversify income sources and deal with rural DFs including seasonal unemployment. Their total exposure to DFs therefore increases. As a result, regional disparities worsen in times of recession and labour contractions.

In most households affected by covariate DFs such as increased demand for skilled labour, and decreases in formal sector employment or indeed, general downturn-induced contractions in labour demand, the household response in the first instance is to decrease consumption levels: "The testimonies from Chile...recognise such mechanisms as abstaining from buying gas for heating and food preparation, instead substituting more economical combustibles or none at all; ceasing to pay for lights or water in order to protect their ability to pay for food; and changing the schedule of meals from three to two daily" [de la Rocha 1995].

The dominant labour market strategy, however, is to minimise the downturn in family income by increasing the participation of family members (women and children) in the workforce. In non-metropolitan urban zones in Brazil, the participation of non-heads of households women increased by 25 percent between 1979 and 1987 [CEPAL 1991:Table 3]. Female participation rates in Ecuador also increased in the early 1990s, which may reflect the adoption of this kind of survival strategy of poor households [Larrea 1998]. The increase of

female participation subsequent to a labour market DF, such as declining wages or contracting demand for labour or both, has also been documented in India where female participation amongst the poorest households is significantly higher than the national average [Amis 1994]. Indonesia, the lowest income country among those affected by the Asian crisis, witnessed the largest increase in the participation of women over 25 relative to men [Horton and Mazumdar 1999]. This increased participation is a consequence or impact of most labour related DFs, covariate or idiosyncratic, resulting in a loss of employment. The invariable nature of this reaction is indicative of the lack of resilience of the poor to labour market related DFs.

Young households concentrated in low income sectors [de la Rocha 1995:24], and households with aged parents whose children have moved away, are particularly vulnerable to contractions in labour demand due to their limited ability to expand the family workforce. For the old, the DF related to an increased demand for skilled labour is particularly difficult since their skills, if they have them, are often considered obsolete. Combined with persistent age discrimination and social security policies, reemployment for the old is virtually impossible, making this group particularly vulnerable. Households headed by women also suffer from limited workforce expansion capacity and its corresponding increase in vulnerability. These are the households "whose vulnerability--in terms of their structure and composition and the availability of labour--makes them less able both to take advantage of the options in the workplace that open up in an era of prosperity and expanding employment and to defend themselves against a decline in salaries and economic deterioration" [de la Rocha 1995:15].

Women are also very vulnerable to labour market related DFs. According to data provided by the National Institute of Urban Affairs (NIUA) and the 1988 National Commission on Urbanisation, women and children in India account for 73 percent of the population below the poverty line [Amis 1994:635]. If the DF in question is the illness or death of the primary income earner, the lack of reserves of poor families lead them into indebtedness and acute poverty as well as inducing women to enter the labour force. Lower education levels for women and lack of market place skills help to ensure that their entry into the workforce, if it takes place at all, is in the irregular and unprotected segment of the informal market: "an extremely important feature of the low income households is that the activities in which females are engaged are essentially low paying requiring low skills, and are extensions of domestic work." [Amis 1994]. Consequently, further DF risks pertaining to the labour market will affect women more in a worsening cycle of exposure and vulnerability. The idiosyncratic DF of the unexpected death or loss of employment of the head of household may in time be converted to a covariate DF. If the increase in the demand for skilled labour continues to marginalise the poor into worsening work conditions of the informal sector, the incidence of accident and death on the workplace may rise. In Latin America, the vulnerability of women to labour market related DFs is compounded with social tensions documented with the loss of the male identity as the 'bread winner'. Incidence of domestic violence, with adverse affects on women's productivity at the workplace, are extensively documented [Barrig 1993; Escobar and Roberts 1991; Moser 1989; de la Rocha 1995].

Increased domestic violence also places children in a particularly vulnerable position.<sup>43</sup> Loss of the principal income earner that precipitates a woman's entry into the workplace has contentiously been related to the observed malnourishment of urban children under two in

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<sup>43</sup> Discussed in detail in Section II.1.

periods of crisis. The lack of breastmilk alternatives and a general neglect of children have led to lower participation and success rates in school [de la Rocha 1995: 23]. The particular vulnerability of low-skilled, uneducated workers in the face of economic downturn and labour market DFs has already been discussed. Amis [1994], in the context of India, argues that it is the general poverty of the household that accounts for poor nutrition for children and not the employment of the mother *per se*. Urban children are particularly vulnerable to labour market DFs that induce female participation in the workforce, due to a lack of adequate childcare, less problematic in rural areas where the extended family unit more often remains intact.

#### II.5.4 Costs of Risk Aversion

The above household strategy of increasing family members' participation in the workforce with the illness or death of a primary income earner, a contraction in formal labour demand or other labour related DFs, may become risk averse behaviour as the economic situation improves. In Indonesia, school participation in the age groups 7-12 and 13-19 decreased as a result of the response to declining family income [Horton and Mazumdar 1999]. A similar phenomena was documented in Latin America with an increase in the early 1990s in the number of young males between 15 and 25 who were neither studying nor working [de la Rocha 1995]. Maintaining a family with as many income earners as possible is a common strategy adopted by both the urban and rural poor. In light of the previous discussion on the degree to which low skills and education increase poverty, vulnerability and exposure to labour market and covariant DFs, the cost of risk aversion here is high if workforce entry is given priority over education and training.

#### II.6 DFs/risks of changes in staple prices relative to money wage-rates

All households, whether rural or urban, are susceptible to DFs in the price of food (Timmer, 1988), except for a construct almost mythical today, and becoming increasingly far from reality as market integration proceeds: the pure subsistence household, producing exactly and only the food that it consumes, purchasing and selling no farm inputs (not even labour), and using the market for neither buying nor selling.<sup>44</sup> Almost all farms buy and/or sell labour and other inputs, and staples and other outputs, and therefore are aware of and react to price signals in making certain household decisions.

For the poor (as opposed to pure staples-traders), the problem is not about 'food prices' *per se* but about 'corn-wage x employment' relative to 'price of main staple x minimum household requirement'. This is crucial, because some outside events, including some policies, cause the wage-rate (or wage-rate x employment) to fluctuate in the same direction as the price of the main staple (or price x minimum household requirement), a covariance that helps the poor; while other events/policies cause employment and/or wage-rates to fall just as staples prices rise (as in the dry season), doubly threatening the reserveless poor.

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<sup>44</sup> An elegant statement of *some* of the rigorous conditions and implications of market-free subsistence is Pope's 1717 imitation of Horace's 'Beatus vir ..', reprinted in Butt [1977] 'Happy the man, whose wish and care/A few paternal acres bound,/Content to breathe his native air/In his own ground./Whose herds with milk, whose fields with bread,/Whose flocks supply him with attire,/Whose trees in summer yield him shade,/In winter fire/.../Thus let me live, unseen, unknown/..' Even such an isolate would need some means, seldom market-free, to turn corn into bread.

The same changes in staples prices (or household staples costs) relative to money wage-rates (or household labour incomes) affect different sorts of poor people differently, maybe even in opposite directions since

- (a) a growing majority of the poor are net buyers of food, and *a fortiori* of their main staple, over the typical year in most countries, but not in all;
- (b) many of the poor are labourers or even microfarmers of cash crops, and for them the question is how their (still mainly labour-) income from these fluctuates via-a-vis the price of their main staple; and
- (c) in different circumstances and on different assumptions, effects of a rise (or fall) in the corn-wage (or in employment income relative to household food requirements) may be opposite.

But (i) the more available, good, and equal is owned farmland, the likelier are pro-poor effects of higher staples prices in terms of wages to dominate anti-poor effects – more actual or potential net food sellers among the poor; (ii) in the long run the employment effect could be much more than in the short, and staples and other consumption costs less, as buyers of grain and sellers of labour adjusted, (iii) higher food prices mean more secondary demand for rural non-farm sector (RNFS) outputs and employment to make them (but this is offset by lower real employment income – and workers have a lower marginal propensity to consume, especially on locally produced items, than net employers), (iv) the effects in general equilibrium, or even multimarket analysis, could be different from the effects in the sort of partial-equilibrium analysis.

As a result, different groups of poor people will be affected differently, indeed maybe oppositely, by the same rise in the price (or cost of household requirement) of staples relative to the wage-rate (or to household employment income). Probably a big majority of the urban poor will be net losers – though even there many pool part of their income with ‘share-family’ rural households (migration) and many more of the poor are among the 8-12 percent of urban people – in big cities as well as small towns – typically dependent mainly on ‘urban agriculture’ for livelihoods. If the urban poor are a rising share of the rural poor, then the usual liberalisation-induced short-term upswings in real staples prices will harm a growing proportion of the poor and help a falling proportion, even if secondary-employment-cum-general-equilibrium effects are allowed for.<sup>45</sup>

### **II.6.1 Exposure to DFs in staples prices relative to real wage-rate**

Low-income households tend to spend a greater proportion of their income on food, and to derive a much greater share of income from hired or self-employment, than higher-income households, and thus to benefit (lose) more from desired (damaging) fluctuations in the corn-wage.<sup>46</sup> Uncertainty about prices and sudden staples/labour price changes, therefore, can have a significant impact on the income and welfare of poorer households.

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<sup>45</sup> But liberalisation and ‘technology’ are supposed to, and well may, induce long-run falls in real staples prices, reversing this effect.

<sup>46</sup> Even the self-employed – unless committed never to enter the labour market, either as employees (as may be the case with some non-migrating rural members of some high sub-castes in India) or as hirers - are affected by changing real wage-rates, because these affect the opportunity-cost of the work put in on their own farm, or other, enterprises.

Ahmed and Bernard [1989] showed that higher prices of the main staple (given price-elasticity of demand) in Bangladesh cut real income of most of the poor much more than it was raised by the combination of elasticity of (rice) supply to rice price, and of labour supply to (rice) output.

Ravallion [1989] found that the rural rich in Bangladesh are likely to gain and the rural poor to lose from increase in price of food staples in the short run. In the long run, however, the welfare of a typical poor household is likely to be neutral to the price of rice in the long-run. The long-run welfare effect will, however, vary amongst the poor and (contrary to intuitions based on partial equilibrium analyses which ignore wage response), the effect on welfare of a price increase appears more likely to be positive for the poorest households than for those which are less poor. This is presumably due to long-run employment-related elasticities being above short-run.

Often price fluctuations occur as a result of macroeconomic reforms. The recent financial crisis in Indonesia for example, led to dramatic price increases throughout the economy. Levinsohn *et al.* [1999] found that the poor had been hit disproportionately by these increases (combined with effects of crisis on employment and wage-rates (both mainly urban)), the extent to which they were affected dependent upon whether the household was urban or rural. Agricultural self-production dampened the crisis somewhat in some rural households. This result seems to collide with that of Poppele *et al.* [1999] who claim that the rich lost more than the poor, urban than rural poor, and many rural poor gained from crisis and devaluation. In fact, Poppele *et al.* showed that rich areas were hit hardest. This is not the same as saying that rich people were hit hardest. It is quite possible that poor people within the rich areas were worse hit. Moreover, the latter study surveyed the respondents a year after the crisis, and if the poor were hit hard in the first shock, by the time of the survey it may seem that they were doing better than the rich, and even showing positive growth. This suggests that the urban poor are more vulnerable to macroeconomic crises that increase domestic prices, with the impact being particularly harsh in countries with little or no social insurance.

Staples prices can also rise as a direct consequence of macroeconomic reform processes whereby governments undertake price liberalisation programmes. This is because such programmes usually involve removal or reduction of subsidies, of parastatal monopoly procurement, of exchange-rate overvaluation, and of other interventions designed to keep the price of tradables, including most food, at an artificially low level at the expense of the rural population. It would be expected that increases in food prices towards market levels would remove this implicit tax on the agricultural sector and act as an incentive to agricultural producers thereby increasing output and hence incomes, with an augmentation of welfare and food security for the rural producer and a narrowing of the rural-urban income gap [Bourguignon *et al.*, 1991] – but at the cost of short-run declines in food security for net food buyers.

Barrett [1998] confirms that in Madagascar, liberalisation in the late 1980s engendered real agricultural growth but heightened food security stress among small-holder food producers. Liberalisation increased the mean national price of rice (by far the largest sector in the economy and the main staple) by 42 percent and variance of rice prices by 52 percent. With subsequent aggregate agricultural output, growth rates increase from 1-2 percent (rice from 2-3.6 percent) which although modest were the highest levels in 20 years. Despite output growth being especially concentrated among small-holders, there was deepening poverty both

during and following liberalisation, in particular in the very areas where positive output response was taking place.

Barrett found that these areas were disproportionately populated by net buyers and small farmers, with 69 percent of rice farmers consuming more rice than they produce. Such effects could be explained by Bhagwati's classic theory of immiserising growth whereby shocks/changes that increase the mean/variance of food prices can generate food insecurity and thus reduce welfare. In response to these conditions, risk averse net buyers in incomplete markets will work harder and be more productive, expanding output growth, as a means to survive. Though positive aspects of the liberalisation process such as agricultural growth are observed, the total welfare impacts from the process are thus negative.

There is controversy and varied experience of how agricultural liberalisation affects levels and fluctuations in welfare [Commander (ed.), 19xx; Hussein and Lipton, 1997]. This is partly because liberalisation usually raises the real price of tradable farm inputs before those of farm outputs. It is mainly because the distribution of costs and benefits varies with price-elasticity of farm supply; with distribution of land, water, and other forms of access to farming; and with proportions of the poor and near-poor in farming, rural non-farm, and urban work.

## **II.6.2 Vulnerability to DFs in staples prices relative to real wage-rate**

Particularly vulnerable households include those less able to expand labour supply in response to dearer food, i.e. those with several small children (known to over-represent the poor) or above average proportions of old people (known to under-represent the poor) i.e. fewer productive members, or those coping with a major life-cycle event such as the death of a productive member, implying increased vulnerability due to covariance of risk.

Barrett [1996] characterises those most vulnerable to price risks as rural residents in infrastructure-poor economics which have spatially concentrated patterns of food grain storage, year-round net food buyers (mostly urban residents, rural landless poor) and peasants who switch between the roles of net food buyers/sellers in a distinct seasonal pattern. There is much research supporting Barrett's assertion that many farmers have such seasonal switching [Ellsworth and Shapiro, 1989; Longhurst *et al.*, 1986]. This has two main implications. First, poor must sell food when cheap and buy when dear due to normal seasonal price fluctuations – measures to help the poor stagger sales or purchases would hugely mitigate effects of food price DFs and risks. Second, food price rises – certainly absolutely, often even relative to wage and/or employment income of unskilled labour – actually HELP many of the poor in the seasons when they are net buyers, while HARMING them more if concentrated in seasons when they are net food sellers. So while significant food price increase – or changes in fluctuations and risks - could be an incentive to agricultural producers to expand output, the impact on net food buyers can be to erode their real incomes as an increasing proportion of their expenditure goes on food. Barrett's empirical analysis of rice price data in Madagascar implies that price variability and skewness differ between rural and urban areas to the detriment of food security and welfare of rural peasants.

As lower income groups consume disproportionately high levels of food to income, their purchasing power is more seriously eroded during periods of increasing food prices. This may induce them to take recourse to reducing consumption as a coping mechanism and

thereby create health risks. For instance, during the recession in Brazil 1981-5, food prices increased more than other prices, both at retail and wholesale levels. In Peru the number of persons unable to afford a minimum food basket increased from 51 to 70 percent (between 1982-4), and in Mexico the cost of a basic diet increased from 8.5 to 13 percent of the minimum wage between 1982-1986. Also in Uganda, the minimum number of wages required to meet minimum calorie intakes increased from 0.6 to 4.5 during 1982-4 [Pinstrup-Andersen, 1988]. The closer to 1 is the proportion of income spent on food, the less is the scope to reduce nonfood expenditures in response to food price rises and thus maintain food consumption.<sup>47</sup> Yet those spending high shares of income on food are those most likely to be near the margin of adequacy, i.e. most vulnerable when food prices rise to (a) health damage from a cut in real food spending as well as to (b) having no alternatives to such a cut – also because of worse access of poor to borrowing, networks, etc.

In Sri Lanka economic reforms also provoked price changes. Comparative cost of living indices for 1978-9 and 1981-2 show a 94 percent price increase in food and a 91 percent increase in non-food items invoked by policy. During the same period there was a significant reduction in calorie consumption amongst low-income households in rural, urban and estate categories [Ederisinghe, 1988].

There is varying evidence on whether poor more/less likely than others to get high shares of rural income from the RNFS. Longhurst *et al.* [1986] state that poor people appear to have less opportunity than those with higher incomes to diversify off-farm activities and income sources as a counter-seasonal strategy. Lipton [1986] finds that in Sub-Saharan Africa, compared with South Asia, seasonal variations in yield and price tend to impinge more directly on poor people because a larger proportion of poor people in SSA work on the land and fewer have non-agricultural employment income than in South Asia. Tribal tenure rights often mean that rural producers cannot mortgage their land in response to a crisis brought about by a DF such as price fluctuations.

In her study of ICRISAT villages in India, Kochar [1995] observed that 70 percent of the households in the sample earned (labour market) wage income and, on average, such income comprised 25 percent of the household's crop profits. However, there are notable differences between small and large farm households as for 87.5 percent of small households earning wage income, the income amounted to 224 percent of the crop profits, whereas 46.4 percent of large farms earned wage income which accounted for only 8 percent of their crop profits.

A recent survey of rural non-farm sector [FAO, 1998] provides an indication of regional variations of the RNF activity. Average non-farm income shares (as percentage of total rural income) are higher in both Africa (42 percent) and Latin America (40 percent) than Asia (32 percent). A closer look at the data reveals that poor sub-regions tend to have lower shares of RNFS income than their richer counterparts – West Africa (36 percent) vs. East and Southern Africa (45 percent); South Asia (29 percent) vs. East Asia (35 percent). Moreover, the coefficients of variation of RNFS income shares are also highest in the poorer sub-regions. This suggests that it is difficult to conclude that income diversification by the poor is a price risk mitigation strategy. All the same, it is likely that in poor agroclimatic zones, households (more prone to harvest risks) usually earn more from migration than the RNFS. In infrastructurally poor rural areas on the other hand, households (more prone to price risks) depend more on local sector RNF for employment than on migration.

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<sup>47</sup> Indeed, such reductions are specially likely to bring other sorts of basic damage, to health or education.

Kochar [1999] finds that household income can be relatively well-protected from idiosyncratic crop income shocks despite the absence of formal insurance markets. In a study of the Indian rural economy male household members were seen to increase their market hours of work in response to unanticipated variations in crop profits. This implies, however, that households which are predominantly or all-female are less well-placed to cushion the blow of an unexpected fluctuation in food prices due to barriers to females entering the labour market. Using the Indian NSS data, Lipton [1983] showed that women's labour participation and employment tended to drop in slacker seasons by a much bigger proportion than men's, which would tend to confirm Kochar's finding, but one has to be careful here. In slack seasons and bad years it is true both that demand for labour falls, and that – although pressure to supply labour rises, labour supply may well, indeed on the evidence does, drop substantially, because the 'pressure of need' effect is over-ridden by the very high transactions costs of finding work at times when there is little or none to be had.

Rural small-holders tend to receive lower mean sales prices over the year than do other food sellers [Barrett 1996]. Peri-urban farmers enjoy higher food prices immediately post-harvest which is also when rural smallholders sell. Rural large farmers are more likely to sell in pre-harvest price peaks when rural small-holders become net buyers of food. Such seasonal switching between net seller and net buyer positions of peasants can impact upon their welfare, as they face undesirable means/variances in prices in either role. Notable when switching to net buyers as supplies become scarce in the pre-harvest period, the prices they face become higher and more variable which coincides with the period when real wage-rates, participation, and employment are all lowest for rural smallholders. Reversed food flows i.e. from urban to rural areas, occur in hungry season in response to such increasing demand but rural prices remain variable due to reasons such as concentrated food storage in urban areas, distanced from rural markets, which leads to a time lag in arbitragers mitigating price variability (as well as market thinness/intermediary market powers). Rural prices also remain high in this season due to differences in transaction/communication costs and again with arbitragers slower to mitigate upward food price spikes (skewness) in rural areas than can occur particularly in the hungry season. This results in upward food price movements that can be more extreme and last longer in rural areas. These observations have been empirically confirmed by Barrett [1996] in Madagascar and should be applicable to all low income economies which are infrastructurally poor and have spatially concentrated food storage.

Credit markets have received a lot of attention as an instrument through which consumption can be smoothed in the face of DFs in staples prices (relative to wages and employment) and therefore in crop incomes [Kochar 1999]. Welfare variations following staples price changes - unlike those following output changes, or indeed cash-crop price changes – tend not to be covariate even within a village: some gain, some lose. In particular, big farmers' capacity to lend – or put money in the bank, etc. - rises when staples prices rise, i.e. when deficit farmers and labourers are in most need of credit.<sup>48</sup> So credit is a good vehicle for correcting welfare fluctuations due to staples price changes (relative to the real wage and/or employment), but a much less suitable vehicle for compensating poor losers from covariate fluctuations in welfare due to falling cash-crop prices or to harvest shortfalls). However, in most rural areas credit markets are not only fragmented or underdeveloped but also many small farmers do not have access to such markets through lack of collateral (or for reasons cited by Stiglitz and Weiss – moneylenders don't charge the poor more (because that would make the poor's

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<sup>48</sup> Effect on interest rates of higher demand for credit to buy food when it's dearer, incidentally, is thus countered by higher supply of credit.

activities, and hence repayment, riskier), but instead deny the poor credit). It is therefore more difficult to use savings and borrowing to smooth out consumption.

### **II.6.3 Risk aversion**

Agents who are risk-averse prefer low variability in income, thus also in prices. Agents preferences as to skewness in prices depends on their net buyer, seller position. Overall net sellers prefer high means, low variance and positive skewness while net buyers prefer low means, low variance and negative skewness in food prices [Barrett 1996].

Barrett [1994] provides empirical evidence of counter-aversion behaviour amongst rice farming households in rural Madagascar. He demonstrates smaller farmers have higher yields because, being food-deficit, food-purchase-price risk encourages them to produce more, whereas bigger farmers, holding food surplus and facing food-sale-price risk, are encouraged to produce less.

Widespread evidence shows that many small-holder producers are net buyers of the food crops they grow and many are also risk-averse. Among populations endowed with just labour and land with thin or missing land markets, adjustments to labour allocation is their primary means for coping with shocks [Barrett 1998].

### **II.6.4 Covariance with other risks**

Natural disasters such as drought or floods often lead to harvest failure, a reduced staple supply and consequently to a rise in food prices.

### Section III. RESPONSES AND POLICIES

The objective of this section is to draw out policy implications for improved risk management from the analytical framework developed in section I and the evidence reviewed in section II. The section will address six key issues:

- ***What do the poor do to reduce, mitigate, and cope with exposure, vulnerability and aversion to DFs/risks?*** (III.1)
- ***What are the costs, to the poor, of private provision of DF/risk management?*** As developed earlier in Section I, the total costs of risk/DF to the poor comprise of: (a) utility cost - the unpleasantness and discomfort of a particular DF/risk; (b) direct cost of reduction, mitigation or coping; (c) opportunity cost of lost labour income, education, etc. while exposed; and (d) aversion cost due to adoption of low-risk/low-return portfolio. (III.2)
- ***What should the State do?*** What levels and types of State action are conducive to an 'optimal' outcome for poverty reduction? The case for public intervention arises either because of failures in the private market for risk management devices accessible by the poor (e.g. due to asymmetric information), or because public provision or subsidisation to the poor, of the tools of risk management is more cost-effective or feasible than alternative ways to redistribute to the poor. The sub-section will distinguish between policies towards (a) 'partial' DF management, either by State action, or by changed incentives to private action (by those exposed to DFs or by suppliers of, say, credit, insurance, health care) in respect of exposure, vulnerability or aversion to each of the six specific DFs/risks in turn, and (b) 'total' DF management, i.e. policies to improve, say income diversification or credit access. (III.3)
- ***How serious is the danger of crowding out of informal mechanisms by State provision of DF/risk management?*** (III.4)
- ***Given the balance of advantages to governments, politicians and civil servants, their values and opportunities, and the pressures on them, what are real-life States likely to do?*** This is the usual question in political economy: what policy sets will recruit and maintain enough support to 'work'? The sub-section will review whether the main routes of state action - workfare programmes, safety nets, social funds, food distribution and food subsidy - contribute to management of each type of DF/risk. (III.5)
- ***How important are various sorts of State action to alter risk/DF management in reducing poverty? Should 'benevolent' outsiders (or State insiders), concerned with poverty reduction, devote more time, energy or cash to reducing DFs in the welfare of the poor and near-poor – rather than to the other routes to poverty reduction, viz. raising the mean of income or consumption, or obtaining a more pro-poor distribution of it?*** (III.6)

Before exploring these three approaches, we signal our conclusions.

- DF/risk management creates problems of market *failure* (partly due to externalities and public-goods issues); of distributional and other undesired consequences of market

*success*; and of the costs of State action – direct costs, opportunity costs, undesired consequences, possible State failure. How do these now-pervasive issues in economics alter the poverty-reducing impacts of State action on DF management? In particular, some standard objections to public action, or public encouragement of private provision, turn out to be arguments for *more* such action in the area of improved DF management. Private insurers, providers of credit, or other sources of consumption smoothing or DF reduction, are often discouraged from serving the rural poor by ‘problems’ of crowding out, moral hazard, and adverse selection. Such ‘problems’ cause losses for public providers too - but these services enable users, especially the poor, to adopt portfolios with higher DF and higher expected net income. Hence there is more GNP, accruing disproportionately to the poor. Hence the ‘problems’ strengthen, not weaken, the case for collective, perhaps State, action to provide services such as crop insurance.

- Political-economy issues affect the pro-poor targeting of public provision, whether in DF management or otherwise. But it depends on local circumstances whether political-economy issues strengthen or weaken the anti-poverty case for focusing State action more on improving DF management, rather than on (other) targeted anti-poverty programmes.
- Much empirical work [notably Kahneman and Tversky, summarised in Bernstein 1997] confirms that - though *most* people are *modestly* averse from *risk* as such, the poor *somewhat* more so than others – *almost everyone, especially* if poor or near-poor, is *strongly* averse from *loss*, and adapts behaviour accordingly.<sup>49</sup> State action to complete, inform, or correct market outcomes affecting DFs, therefore, should concentrate, not mainly on reducing ‘risk’ or the ‘coefficient of variation’ (or even downward semi-variance) in poor people’s income or welfare, but on reducing their exposure or vulnerability (and hence aversion) to *loss*, especially to the prospect that DFs may push people below a basic or disaster level of well-being. First, such policies raise welfare more, because reduced loss, less disaster, rather than lower risk as such, is seen as a main requirement of increased well-being by most people and especially the poor. Second, therefore, policy does more to help them undertake profit-raising activities – improving their chances to get better off – by tackling ‘loss aversion’ or ‘disaster aversion’ rather than risk aversion.<sup>50</sup>
- There is no a priori assumption that prevention is in all areas better - even for the poor - than cure. For some sorts, severities, or surrounding conditions of DF - given the cost of treatment - mitigation may be better than reduction, and/or coping than mitigation. Analogously, the gains (including the gains to the poor) may be more from reducing aversion than from reducing vulnerability, and/or from the latter than from reducing exposure.
- Most pro-poor policymakers have mistakenly neglected DF/risk management. But it would also be a mistake to go to the other extreme - to attack poverty through DF

<sup>49</sup> By ‘loss’ people sometimes mean a fall in welfare or income, and sometimes an outcome less favourable than some expected norm.

<sup>50</sup> However risk aversion - like inequality aversion - exists independently, both of ‘disaster aversion’ and (contrary to what is often misstated as an implication of the Arrow-Pratt theorem) of diminishing marginal utility of income. This is because *most* people dislike the *condition* of being at risk on *important* matters *most* of the time. Hence people insure (and makes a case for State or other collective action to counter failed, missing or underinformed markets in insurance, quasi-insurance, or conditional contingencies such as options. The italicised words show why many also gamble, especially with small sums [Friedman and Savage 1949].

management alone, ignoring either growth or redistribution except to the extent that one or the other interacted, as cause or effect, with DF management. Both ‘extremes’ are mistakes for two reasons. *Diminishing returns* imply that the poverty reduction obtainable from extra cash, time, or political energy devoted to any one method of reducing poverty - growth, redistribution, or better risk/DF management - will eventually dwindle, as ever-rising resources are devoted, first to the most promising examples of that method, but subsequently to less and less productive examples. *Complementarity* implies that, even without diminishing returns, the welfare gains from any one method are likely to be increased, if resources are also being devoted to the other methods.

### **III.1 Private action for DF/risk management**

Table 13 depicts the various strategies adopted by poor households in DF/risk management.

### **III.2 Costs to the poor of private provision of DF/risk management strategies**

At the most immediate level costs may be incurred, for example, if a farmer plants safer traditional crops rather than more profitable but riskier new varieties. A larger set of costs is less apparent. If parents hope to rely on their children for old age support, for example, they may have more children than otherwise. In congested areas, this risk mitigating strategy can lead to equilibria that are much worse than those with alternative insurance mechanisms. Similarly, if households engage in systems of reciprocal transfers to diversify idiosyncratic risk, it may be difficult to put aside surpluses for individual investment. Capital accumulation is restricted and the equilibrium again may be inferior – and could be worse than that emerging in a world with no informal insurance.

There is a role for policy and encouraging convenient and secure opportunities to build financial savings in one route that will help in some circumstances.

### **III.3 Welfare economics of poverty reduction, DF/risk management, State action**

In this section we ignore political-economy issues, and ask what a benevolent outsider should WANT the State (or its many and never politically monolithic agents and agencies) to do. Assume that her main goal of policy is poverty reduction; that growth matters too; and that desired policy outcomes (though not necessarily particular policies) should be sustainable politically, fiscally, administratively and ecologically. What should be the role of collective action, and within that of the State, in producing, ‘providing’ (i.e. financing), subsidising, or otherwise altering private incentives to supply or demand, items (services, products or institutions) that affect risk/DF management?<sup>51</sup> Which items should various branches of the State be involved in, how, for how long, for whom, and why? We defer to section III.5, where ‘political economy’ is explicitly considered, whether some State DF-management actions should be targeted on groups of intended gainers, such as the poor.

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<sup>51</sup> The issue is raised broadly, because policy choices, and the scope and limits of State action, in matters such as agricultural research, water supply and transport – matters seldom considered under the rubric of poverty-oriented risk/DF management – may affect the security of the poor more than topics conventionally placed in that rubric, such as social safety-nets for food distribution or public-works employment.

There are a number of overarching issues about public-sector activity to benefit the poor by better DF/risk management.

- Under what conditions is the probable efficiency impact of market failures better or worse than that of collective-action failures, allowing for the direct and opportunity costs of market and collective action?
- Under what conditions is such collective action, if justified, likelier to be adequately or efficiently provided - allowing for side-effects as well as costs - by the State, rather than by a kin-group, community, commons, or 'club'?
- How are these conclusions modified by concerns for fair or equal (not the same thing) distribution of income and of costs?

This section does not rehearse the general issues,<sup>52</sup> but asks whether they apply *differently* if we focus on risks or DFs as they affect the poor. It turns out that several of the key topics, in the general analysis of market and State success and failure, indeed raise different issues, and require different policy analysis, when we focus on improving the poverty impact of DF/risk management.

### ***Market vs. collective cost/failure/'success' in DF management supply to the poor***

The main sorts of 'market failure' probably involve information **failure (restricted or costly information**, e.g. high search costs); **asymmetric information**; **non-appropriable externalities** (systematically undersupplied goods, including **public goods**, with positive externalities; oversupplied goods with negative externalities); and **contract enforcement costs**. How do these affect the anti-poverty case for or against State DF management? For information-cost reasons, pure market provision of services to reduce *vulnerability* to DFs, in dispersed low-income economies, tends to be localised, causing serious problems with covariate, but not idiosyncratic, DFs. However, in neither case does it often pay private providers to service the poor, who usually lack collateral and thus carry high enforcement costs (and high fixed costs of administration).<sup>53</sup>

Can collective action, by communities or by the State, help? Recent empirical work reveals much, and varied, collective action by kin-groups and other community organisations for consumption smoothing [Besley 1995], but this too provides few group incentives to seek out the poorest. State intervention to reduce the poor's vulnerability to DFs, e.g. to provide credit for consumption smoothing, has faced severe problems: 'financial repression' of private institutional development [McKinnon 19xx; D. Adams 19xx], politicisation of repayments, soft budget constraints – and political-economy rather than pro-poor distribution of State provision (section III.5). The often successful fashion of the 1990s has been the provision of microcredit by community-level, often NGO, mediation, with arm's-length support from State or international organisations; but this approach too tends to miss the poorest [Mosley and Hulme 19xx] and may confuse financial development, enterprise support and poverty reduction (the poorest often need consumption smoothing *before* they can face the extra DFs associated with enterprise-building).

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<sup>52</sup> Except to stress a general point of special importance in DF/risk management: that, despite ideological opposition between markets and of public action, the two are frequently complementary, in the sense that more current consumption foregone to pay for investment in *either* market development and liberalisation, *or* State activity, increases substantially the marginal social benefits to existing investment in the other.

<sup>53</sup> Price discrimination against poor users of DF services (e.g. borrowers) is often alleged, but seldom pays service providers, e.g. lenders, due to moral hazard – the risk that, for example, borrowers will take greater risks due to any non-equity loan [Stiglitz and Weiss 19xx]. Most Indian farmers – characteristically, the poorest tercile – hardly ever borrow [Rural Credit Resurvey, Reserve Bank of India, 1989], largely because they cannot.

**Restricted or costly information** is the main reason why most traditional institutions for reducing vulnerability to, or coping with, DFs - moneylending, rotating credit and savings associations, etc. - tend to be localised,<sup>54</sup> so that the lender, etc., has a better chance of knowing which customers are 'safe' to support in bad times. The drawback of localisation is that 'covariate' DFs, such as harvest failures, tend to hit most local customers, and the provider, at the same time, so that localised provision of DF-management services tends to break down - though it can work well for idiosyncratic DFs (for customers who can afford it).

Unfortunately, when large, e.g. national-scale, service providers try to provide DF management services in many villages or suburbs - though covariance among DFs clearly falls - local knowledge is lost and enforcement costs rise. Dealing with this through intermediaries [cf. Barbara Harriss, 'Secret Agents'] involves principal-agent problems, though in Indonesia small-scale investment and consumption-smoothing loans by PKK have successfully used 'stable' village leaders in this way.

The State intervenes in DF management provision partly to cut through this dilemma, that while local provision fails with covariate DFs, national provision cannot afford to obtain local information. The State also intervenes for two other reasons: because local charges for DF provision seem very high - hence the initial commitment of State credit policy in India to 'eliminate' the moneylender, though his high charges were probably due more to high costs than to local monopoly. But traditionally the State has intervened with the 'bottomless purse' of a soft budget constraint on lending institutions; politicised low interest rates and repayment non-enforcement; and directed lending that ignored borrower potential in favour of categories imposed on lenders.

Public policy is clearly required to address information-rooted, systemic failure of markets in DF management services, especially for the poor who lack collateral. Mass directed credit, financed by an inflationary State, has proved an unviable means of DF management and is unlikely to return, though it was not a complete failure<sup>55</sup> The current synthesis, using NGOs and peer monitoring, is the best we have but is not as soundly based, stable, or poverty-focused as it appears [Mosley and Hulme 19xx; Sinha 1998].

Probably, restricted and costly information presents inherent and severe limits on the scope for purely transfer-based (including credit-based) approaches to reducing DF damage via lower ex post vulnerability for the dispersed rural poor. Arguing the toss between state and market 'solutions' has got some of the way towards a satisfactory synthesis, with State or quasi-State subsidy to administrative costs (but not interest rates to final borrowers) for peer-monitored groups run by NGOs. There are after all millions of poor borrowers, who have used this system to reduce vulnerability to DF management, in Bangladesh alone [Khandker et al 19xx]. But they are seldom the poorest or most vulnerable; the constant pressure to present the NGOs' task as 'microenterprise credit' ensures that this will continue. Nor are most successes, in this new(ish) State-community-NGO mix of action against vulnerability to DFs, in areas prone to covariate DFs. Grameen 'clones' in Africa seldom succeed [Mosley and Hulme 19xx].

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<sup>54</sup> A 'proof through the converse' is India's nationwide network of informal lending - but to largely formal borrowers, using a superb and historically rooted information system - by the shroff system [Timberg, 19xx].

<sup>55</sup> Apart from bad experiences when inflation rates changed sharply, as in parts of Latin America in 1975-85. For instance, even at its worst in the late 1970s, farm loans from the Indian public credit system steadily increased as farm size fell - the opposite of the case with private loans [Reserve Bank of India 1989].

If people are poor, dispersed, numerous, and exposed to big DFs that often strike many victims at once, there is an inherent limit (mainly due to information problems) to providing services to *curb vulnerability* - whether by private, collective community, public, NGO-based, or mixed action. Information and servicing are inherently too costly. Focus needs to shift towards helping such people to *raise mean income* through growth and distribution, and to *reduce exposure to DFs* by diversification (e.g. via irrigation, or contract employment).

**Asymmetric information** carries the ‘opposite surprise’, in its impact on State provision of services for improved DF management, from information failure. Information failure or high cost, while indeed limiting private provision, does not clearly improve the case for State action. Asymmetric information creates problems that cause private providers, rationally, to limit their provision and especially to exclude the poor. One might think that these problems would also impede cost-effective collective, including State, action. Indeed, they make it more expensive, but actually increase its benefits too. State-induced interventions in DF management, if they are to cost-effectively improve either economic performance or the welfare of the poor, should *welcome* moral hazard, some forms of adverse selection, and their logical ‘cousin’, crowding-out. These - while causing DF management services to be systematically undersupplied by private providers - indicate success in reducing DF-aversion among users, and thus tend to raise GNP and reduce poverty.<sup>56</sup> An implication is that public services in this area - while seeking financial efficiency with hard budget constraints - should not seek zero or minimal public deficits.

Losses on crop insurance, for example, deter private provision and render public provision fiscally expensive [Hazell and Pomareda 19xx], because it is the DF-exposed farmers who ‘adversely select’ such insurance; ‘crowd out’ private sources of DF management, such as relatives or moneylenders; and then insinuate ‘moral hazard’ as they undertake riskier but more profitable crop-mixes as a result of their insurance.<sup>57</sup> Such crowding-out, moral hazard and adverse selection in face of crop insurance schemes – while leading to their private underprovision – imply a potential social gain, especially for the poor, from their collective provision. This is unlikely to be feasible at local level, e.g. as a club good, because DFs in harvests tend to hit most local people at the same time. Hence there is a powerful case for State provision of crop insurance, because of, and not despite, the likelihood of moral hazard, adverse selection, and crowding out of traditional methods of DF reduction. Many developed and some developing countries have shown their willingness to incur periodic deficits for non-self-financing crop insurance. If this raises the poor’s long-term income prospects, it may be a desirable form of State action. Market premia should be set where feasible, provided the most affected (the poorest) do not suffer by being unable to pay them.

### ***Priorities within State provision***

First, we exclude *general* measures for improved management of DFs, and ask: which of the six main types of *specific* DF should have priority for pro-poor public action: health, harvest, disaster, violence and conflict, workplaces, or key prices (food staples or unskilled wage-rates)? Normally, the choice should fall on the DFs that cause most misery<sup>58</sup>; appear to be

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<sup>56</sup> As will be shown, this does not mean welcoming high enforcement costs – plainly always undesirable.

<sup>57</sup> Mishra [1998] provides strong evidence for the latter effect in India.

<sup>58</sup> Through imposing costs: direct, of pain or death; opportunity, of foregone income; of treatment; and of (growth-inhibiting) portfolio-distortion, via increased general or specific risk aversion. See above, section III.2.

tractable cost-effectively by public action; yet have proved resistant to cost-effective private or non-public collective, action.

In some places or periods, the main misery-causing and/or publicly manageable type of DF is clear.

In Ethiopia, Sudan and Angola, *violence* – specifically, war and civil conflict - have imposed huge civilian death tolls and massive economic losses over many years [Luckham 1999]. Private persons can and do secure their crops and homes from damage as best they can, but real progress obviously needs public action. In other cases, domestic or public violence against women is clearly the main DF.

*Disaster* dominates local poverty increases after such events as Hurricane Mitch in 1998 or the Turkish earthquake of 1999. Even in such places and times, disaster ranks low as a cause of global and even national totals of DF-related death and misery. However, it is seems a natural candidate for public action because the damage is locally covariate and large, nationally idiosyncratic, poor-focused, uninsured, yet small compared to, say, global aid totals and often even to national military expenses.

In much of West Africa, *health* DFs - from malaria, river blindness, and dietary energy deficiency - still mean that over one in five children die before age 5 (and in Botswana some 30 per cent of adults test HIV-positive).

*Harvest failure* dominates DFs in many drought-prone, unirrigated areas, e.g. arid and semi-arid parts of N and W China and semi-arid India.<sup>59</sup> Private grain trade and migration cut damage, but work less well in small or agro-ecologically homogeneous countries, where harvest DFs are covariate. Food trade tends everywhere to be least helpful, after harvest DFs, to the poorest, whose market demand for food is most damaged, because their farm employment contracts. This suggests a case for public action – to reduce poor people’s exposure (e.g. through public finance of water control for small farms, or of research into more robust food-staples varieties) or vulnerability (e.g. through public stocks, traded options or forward contracts in food staples).

*Workplace contraction* can sharply worsen urban - and in middle-income countries (e.g. South Africa in the early 1990s; Indonesia and much of South America in the late 1990s) national - poverty. Reducing vulnerability or exposure to workplace contraction is especially appropriate for public action, if required adjustment is to be sustainable and not on the backs of the poor. But appropriate remedies do not include laws against redundancies, which discourage and hence *reduce* mean employment.<sup>60</sup> Nor is retaining low-productivity workers in public or publicly subsidised industries a cost-effective form of public action to stabilise workplace numbers - though mass sackings are less cost-effective or politically feasible (as well as less humane) for countries with large workforces of this type, such as India and China, than tackling pending workplace DFs through an anticipatory exit and transfer

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<sup>59</sup> Hence much rural poverty in semi-arid areas proves ‘transient’ in household expenditure surveys. In an 8-year, 6-village study in South India, 90 per cent of persons were in poverty in at least one year, as against half in an average year. The big difference was due largely to harvest fluctuations, though also to ill-health and higher child/adult ratios [Ryan and Walker 1990; World Bank, World Development Report 1990].

<sup>60</sup> In Kerala, the only Indian State to enforce such laws, the proportion of workforce time spent unemployed is, at over 20 per cent, about triple levels elsewhere [National Sample Survey data].

policy.<sup>61</sup> Adjustment apart, public works, successfully targeted on the poor, have cut exposure to workforce DFs, especially in rural areas [ILO 1998], including schemes in Maharashtra, India [Dev 1996]; food-for-work in Bangladesh and Botswana; and some social funds as in Bolivia [Subbarao et al 1997].

**Price-based DFs** (mainly because staple food prices have risen relative to real wage-rates) are, after health DFs which are less usually covariate and hence more manageable), probably the most common, or at least commonly perceived, as harmful to the poor. They are of four main types. *Cyclical* price DFs are the least damaging – because, in sharp contrast to the other three types, unskilled wages move in the same direction as food prices (up in boom, down in slump). *Seasonal* food-price DFs, being non-risky, induce some profit-seeking market corrections (stock variations, trade), but both poverty and remoteness can render such responses too small and/or costly - for the poor to buy, for suppliers to sell, or both. This may well justify public action to reduce food price fluctuations, with two caveats. First, it should focus on crops looming largest in the budgets of the most vulnerable: coarse grains, root crops, broken rice, etc. - but this is often hard. Trade in such crops is thin. Also they tend to be grown as well as eaten by the poor - and anti-DF price interventions that help eaters often harm growers. The second caveat about public action on price DFs is that monopoly procurement and sale have proved an inefficient and ill-targeted approach to public food trade. Use of competitive trading outlets works better. *Harvest-failure* price DFs are like seasonal DFs in effect, but less predictable. So market failure and bad poverty impacts are likelier, and public action (in food or labour markets - see last paragraph) more strongly indicated, though also costlier per beneficiary in an average year, due to preparation and standby requirements.

Finally **adjustment-related price DFs** happen because adjustment tends to correct price biases against tradeables and farm products, including most food staples. The rural poor may well gain in the long run as output and employment respond, but if they eat worse then some of them will be damaged, even dead, in the short run. And the urban poor (except the 10 per cent or so engaged in urban agriculture) suffer a durable, often big, DF. Targeted nutrition interventions [e.g. Berg 1987] are keys to avoiding basic damage to the poor, and thus in making adjustment morally and politically viable.

We need to drop the assumption at the beginning of this sub-section, and ask: when should pro-poor State action be directed at specific DFs, e.g. in prices or health, rather than at DF in general? In extreme cases focus clearly has to be on public action (in this case, one hopes, designed to stimulate rather than crowd out private action) to redress a specific DF: reconstruction after a local flood or earthquake, reducing the staggering health risks in much of humid West Africa, ending DFs due to violence in Angola. More generally, the analysis – and the analogy – of ‘portfolio’ risk, and the advice that public action should induce profit-seeking by lowering the poor’s general and specific risk aversion, should not be overdone. Individuals and households may see their various sources of *income or consumption* as parts of a portfolio (so that more DFs in one part are compensated by fewer in another), but not *well-being* in general. Some sorts of damage, such as the death of a child, are – thank heaven - just not perceived as commensurable with income losses. Further, reduced DF aversion – while a strong extra argument for public action to reduce, say, vulnerability to earthquake, is not the *main* argument: reduced direct misery is.

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<sup>61</sup> But ‘retraining’ has become a rather useless mantra, especially since older workers usually lose their jobs first. Experience in developed countries suggests that both general literacy and numeracy, and specific work search and interview skills, are cost-effective ways to help people quickly to find new work.

However, where public action seeks mainly to reduce exposure or vulnerability to income or consumption DFs (especially among the poor), it is very helpful to look at individuals' and households' choice as they usually do: in terms of their total portfolio of income or consumption sources, of course including sources of costs. This is for two reasons. First, suppose the main source of DFs among the poor is identified, say as harvest failure. The most cost-effective way for public action to do what private action cannot, in reducing such DFs, may not be to reduce, not exposure to farm hazard (e.g. by micro-irrigation) or vulnerability to it (e.g. by crop insurance), but DFs – or their ill-effects – elsewhere in the portfolio, e.g. in health. Second, public action might cost-effectively reduce basic damage to the poor and near-poor, due to DFs, not by acting on any one of the six components of DF at all, but by acting on the portfolio – to increase a household's contravariance among incomes by source; or its covariance of incomes with costs; or its capacity to detach income from consumption by credit or other means of consumption smoothing.

How effective are general measures for improved management of DFs/risks?

**Income diversification:** The extent to which risk affects household-farm behaviour depends critically on DF/risk aversion. Because risk aversion varies with wealth [Newbery and Stiglitz 1981], the incentives to diversify income sources generally are not uniform across the income distribution, and income diversification does not have a neutral effect on rural income inequalities. The existence of heterogenous environments creates incentives for households in poor and unstable agroecological zones to diversify their income sources across zones where the returns to income activities are not highly correlated (for example, through migration) or within zones into activities whose returns do not depend on the harvest. By contrast, in zones with more fertile soils and more stable rainfall, there are more incentives for households to specialise or diversify locally, including into activities that may be linked to crop production through input or output markets. These considerations suggest that, other things being equal, an agroclimatic shock that lowers crop production should have a less unequalising (or perhaps equalising) effect on the income distribution in the unstable zone, where ex-ante incentives for poor and middle income households to diversify are large.

Other things are not equal, however. In the absence of perfect credit and insurance markets, wealthy households are better able to self-insure against given income risks and to invest in risk-reducing cropping strategies (e.g. environment-improving technologies like land quality improvements, irrigation, and flood and erosion control). If diversification is costly (i.e., has high entry barriers) and initially risky, wealthy households are also in a more favourable position to diversify into noncrop activities.

Thus, while a risk model without credit constraints might predict that households will diversify less as their wealth increases (the risk aversion motive for diversification declines as household wealth increases), imposing the condition that households must self-finance this diversification, in light of liquidity and credit constraints facing the poor, may lead to the opposite empirical outcome: the poor may want to diversify for risk reasons but cannot do so because of liquidity constraints.

**Access to financial services**<sup>62</sup>: Two principal effects of access to financial services can be distinguished. One, through access to credit and savings services, households can raise

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<sup>62</sup> Our ideas in this section have benefitted from Zeller [1999].

productive capital to reduce the costs of capital-intensive technology and assets relative to family labour. For example, instead of growing low-yielding local crop varieties with a low level of fertiliser application, access to credit may allow use of improved seeds and fertiliser resulting in production of a higher crop output per unit of labour and land [Feder, Just and Zilberman 1985]. And, saving services lead to accumulation of assets to provide capital for future investment and income generation.

Two, credit, savings, and insurance services (in the form of insurance against idiosyncratic or covariant production, consumption and market risks, access to savings at short notice, and provision of consumption credit for maintaining family labor and the household's human and social capital) can reduce ex-ante income variance, or ex-post consumption variance. These services provide a shield against future DFs/risks to enable the household to reduce risk aversion. Since technology adoption and the level of production and investment increases with the risk-bearing capacity [Eswaran and Kotwal 1985], provision of financial services for consumption smoothing can have indirect and positive impact on future income generation. It can further reduce the cost of privately-provided DF/risk management strategy by substituting for higher cost informal savings, income diversification, personalised or coinsurance strategies as well as higher cost informal credit.

Thus, access to micro-finance has the potential to not only provide production credit, but also contribute to income and consumption smoothing. Though largely ignored so far by the microfinance institutions (MFIs), the poor are more likely to benefit from the latter.

#### **III.4 Crowding out of informal mechanisms by State provision of DF/risk management**

Various private strategies of DF/risk management have been discussed in detail in Section III.1. The range of public policies discussed in Section III.3 may do little more than crowd out the informal mechanisms.

But how good are the informal DF/risk management strategies? Empirical evidence suggests that these efforts are both costly and inadequate. The cost arises because the poor face a bitter trade-off: they can accept DF/risk that could lead to disastrous fluctuations in consumption, or minimise DF/risk in ways that perpetuate poverty. And their efforts are inadequate because risks remain especially at the village, region or national level against which the poor themselves are unable to insure [Kanbur and Squire 1999]. Moreover, most evidence on the extent of informal insurance show that these mechanisms are in fact typically weak. The concern with crowding out is also diminished by the growing awareness that informal insurance can carry heavy and economic social costs. Even if informal mechanisms are effective in reducing vulnerability, they can retard economic growth and social mobility.

Table 14 depicts the range of insurance mechanisms by type of DF/risk sharing available both informally and in the formal economy. Morduch [1999] highlights the inherent limitations of informal mechanisms. For a number of reasons, the concern for crowding out may be highly exaggerated.

**First**, in spite of a heavy reliance on them by the poor, informal mechanisms of insurance are inadequate and are unlikely to be able to cope with systemic risk. Morduch [1991] finds that that the poor have only limited insurance, even against idiosyncratic risks. The effectiveness

is further minimised for covariate risks.<sup>63</sup> Reardon, Matlon and Delgado [1988] found that transfers comprised less than 3 percent of the losses for the poorest households after the 1984 drought in the Sahel. In four Muslim villages near Zaria in northern Nigeria, a 1988-9 survey revealed the importance of informal credit transactions - over one half of the households had neither borrowed nor lent. Loans between villages, however, are much less prevalent than loans within villages. And yet more than half the variation (58 percent) in agricultural output<sup>64</sup> in the region was caused by aggregate shocks that affected entire villages. No matter how good the within-village insurance mechanisms, villagers were unable to protect themselves from one of the biggest sources of risk.

**Second**, many mechanisms are costly. In risk prone areas of India, households may sacrifice as much as 25 percent of average income to reduce exposure to harvest DFs/risks [Walker and Ryan 1990]. Morduch [1990] uses the ICRISAT data to show that households which are more vulnerable to income fluctuations devote a smaller share of their land (9 percent) to risky, high-yielding varieties compared with about 36 percent for households with better access to coping mechanisms. Jacoby and Skoufias [1997] show that when hit by a drop in income, poor households withdraw their children from school. A 10 percent decline in agricultural income across seasons leads to a fall in school attendance of about five days in a sample of six Indian villages. Thus, whether they reduce income or reduce schooling, these and other coping mechanisms, although providing some protection in the short-run, limit their long-run prospects of escaping poverty. Self-protective behaviour limits experimentation and innovation, creating longer-term dynamic losses.<sup>65</sup> Improving safety nets can thus increase average income by reducing reliance on these costly measures.

**Third**, informal mechanisms appear to be particularly fragile when needed most – especially during widespread droughts and floods [Coate and Ravallion 1993]. In such circumstances, when both partners are down on their luck, or when pushed close to the subsistence constraint, holding on whatever one has may be especially tempting despite the agreement to share with others. In general, informal insurance works best when participants have a cushion from poverty. Consistent with the evidence from rural China, the rural Philippines, and rural South India [Coate and Ravallion 1993; Kletzer and Wright 1998; Ligon, Thomas and Worall 1997], theory suggests that reciprocal transfers will be more effective for richer (or nonpoor) households and in less dire contexts.

**Fourth**, informal mechanisms are weak against repeated shocks. When bad conditions are likely to persist for several years in a row, households need to keep very large stores of assets in order to achieve adequate protection.

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<sup>63</sup> One important role of risk reducing intervention is to diversify covariate risk in a way that makes it idiosyncratic for the intervention in question. This is one clear case where formal (by definition capable of more risk diversification) mechanisms perform better than informal ones (which most often need to be geographically concentrated to take advantage of self-enforcement mechanisms) and thus desirable.

<sup>64</sup> This is not the same as agricultural income, let alone income, and least of all real income of the poor. But if the poor consume a larger share of food income, the collapse of local food availability, especially in a remote place, hits them via food prices much more than it does the nonpoor.

<sup>65</sup> Morduch (1995) distinguishes between income and consumption smoothing. The former are actions an agent takes before the occurrence of risk event (such as occupational, crop choice, land fragmentation, energy conservation etc.) while the latter are actions taken after the event (such as migration, cutting down consumption, selling assets, borrowing etc.). Long term dynamic losses can arise both from income smoothing strategies (such as choosing less yielding but also less risky activities) and consumption smoothing (such as withdrawing children from school). Such losses can lead to positive feed backs and poverty traps having intergenerational consequences (Dasgupta, 1998).

**Fifth**, informal insurance tends to work least well for the poorest groups. Informal arrangements are self-enforcing. This means that the benefit of renegeing today must always be lower than the benefit of sticking together. In times of severity, the poorest are most unlikely to be in a position to satisfy this condition of self-enforcement.

**Sixth**, common mechanisms can solidify economic and social barriers along ethnic, gender, generational and class lines [La Ferrara 1997; Fafchamps 1992] and these can contribute to 'poverty traps' [Platteau 1999; Hoff 1997]. Fafchamps draws on African experiences to suggest that instead of leading to cleavages, reciprocal exchange may instead lead to (voluntary) patron-client relationships. Rather than being asked to give more than poorer households, relatively rich households may find themselves in a position to extract surpluses from poorer households. The terms of reciprocal exchange may thus disproportionately favour the rich, although the terms may seem to be in everyone's absolute advantage.

**Seventh**, the institution of family and the inter-generational insurance mechanisms can be a mixed blessing. On the one hand, the institution of the family greatly facilitates informal insurance. On the other hand, the family tends to have a much more limited pool of resources on which to draw. The most important tension arises when the demographic structure of the household is partly shaped by insurance motives. The problem arises because the negative externalities (congestion and environmental degradation) posed by such decisions is not taken into account, leading to a divergence between private and social valuation.

Thus, even where informal insurance is well-developed, public actions that displace informal mechanisms can yield benefits [Morduch 1999].

### **III.5 The political-economy question**

We discuss in this section, where 'political economy' is explicitly considered, whether some State DF-management actions should be targeted on groups of intended gainers, e.g. the poor.

In whose interests is it to provide, or to prevent provision, of various institutions and/or incentives for DF/risk management by the State? What can our 'benevolent outsider' do to align the political-economy outcomes in DF/risk management decisions by the public sector, more closely with the economically optimum poverty-reducing outcomes?

The proposal [in Gelbach and Pritchett 1999] that insurance (and more generally DF management) is likelier to be a political-economy success than targeted anti-poverty programmes because the rich are likelier to support it: is it correct? Really there are TWO antitheses: targeting-not and insure (or DF-manage) vs. do other antipoverty approaches. The two sets of choices have different political-economy implications. The rich many face well-functioning insurance markets even when for Stiglitz-Weiss or other reasons the collateral-less poor don't, and are then not motivated to support public action in insurance. Also, while in India poor (or at least small) farms appear likelier to be irrigated, usually (Africa) water control is largely the privilege of the rich, and health security almost everywhere is, so they have little obvious motive to back better tax-financed security here as it benefits largely the poor, who alone lack it initially. Worse, the rich may GAIN from DFs in poor people's incomes (e.g. the moneylender can foreclose mortgages.) On the other side, targeted programmes may attract the nonpoor via non-current-income payoffs; in EGS (a) rural nonpoor get most gains from roads or irrigation, built by rural public works, but which due to

public-goods nature would not be built otherwise, (b) urban nonpoor were willing to pay the bill [Herring 1983] because it reduced migration pressures on living-space etc in Bombay (a mixed example since RPWs/EGS, while poorly targeted, have of course also an anti-DF component).

### **III.6 The role of DFs/risk management in poverty reduction**

In conclusion, we analyse whether policies for improved risk management to reduce total portfolio risk can achieve more cost-effective poverty reduction than raising mean income of the poor, either by growth or redistribution. Both the political-economy and social protection approaches are pushing strongly towards improved risk management, which has been often underrated in the past. However, concentration on improved DF management, as an area for State involvement, can be pushed too far. It may imply either institutional or market failure (plausible) or else that the poor are mismanaging risk or other DFs (not all that plausible, and when true not clearly policy-curable). Where the reason is institutional failure it is often because such 'failure' is good, or safe, for the powerful; possibly, massive take-over of poor people's land by moneylenders, in bad years when debts cannot be repaid, is a 'rural myth' but the gains to the better-off from DFs that raise their market power vis-à-vis the poor are not. If so, it may be a false hope to achieve cure for institutional 'failures' that deny the poor the means to better DF management, unless the State is able also to change the structure of power, especially by raising the status and voice of the poor; this requires some redistribution, or at least better access accompanied by appropriate growth.

Anti-poverty policies should not crowd out good DF and risk management, especially by the poor, and often should include it. A wide range of policies, not only safety nets, have (with varying success) sought to reduce, mitigate, or help cope with DFs and risks especially damaging to the poor. Vulnerability in bad times, or timidity at all times, in face of exposure to DF (including risk) is often an important, and sometimes a neglected, *component* of poverty. But it is not the *same* as poverty, nor the *main cause*. Many people face few risks, or even fluctuations, yet have very low average income, health and education. Many rich people successfully manage severe DFs, some perfectly predicted, others risks. Thus, a higher mean income or welfare, or better distribution among persons, may sometimes be a more cost-effectively achievable way to reduce vulnerability to DFs (i.e. by making people more resilient and better able to access credit because less poor) than a direct attack on DFs in income or welfare via reduction, mitigation or coping.

## ANNEX A

### WHY NOT A SINGLE MEASURE OF HOW RISKS OR DFs AFFECT THE POOR?

At an early stage in preparing this paper, we had hoped in Section I to develop a total measure of the impact of risks or DFs on the poor, perhaps akin to the alpha-measures of poverty incidence, intensity and severity. We now see this as DAMAGING and probably infeasible for three reasons.

Suppose ‘exposure’ and ‘vulnerability’ are measurable, even multiplicative. They remain sources of potential or ex post loss of consumption and welfare from a DF when it happens. ‘Aversion’, by deterring risk-taking and entrepreneurial uses of labour and assets, is a source of loss of probability-weighted mean (expected) value of income. ‘Adding’ the incidence, intensity, severity, or cost of an individual’s exposure and/or vulnerability to those of his aversion would be adding non-commensurable items through arbitrary weighting.<sup>66</sup>

Useful adding-up is similarly made questionable by two distinctions among *types* of DF: between particular DFs (or risks) and the set of all those affecting an individual; and between those in an income-yielding (or cost-generating) portfolio, and those, such as one’s own death or a child’s dropout from primary school, not fully commensurable or tradable against within- or total-portfolio DFs or risks.

Even within (say) an individual’s aversion, vulnerability or exposure to a particular type of DF, adding-up creates serious problems. (a) Measuring a person’s ‘aversion’ to DFs or risks by, for example, the rate at which her utility diminishes, or the degree to which a bet has to be favourable before she accepts it, ignores the psychologies that make the situation of high exposure to DFs or risks (as opposed to their outcomes) unattractive - or, for gamblers, attractive: psychologies produced substantially by past experiences of success or failure in risk management, experiences strongly correlated with affluence and poverty respectively. (b) Measuring exposure by ‘variability’ is common, but depends on indicators that assume symmetry; consider only the first and second moments; and are timeless. Yet these are indicators of time-ordered fluctuations where undesirability (including risk) has asymmetric utility effects to those of upswings (or good luck).

Aggregate single measures of *total* DF or risk incidence, intensity, severity, size or cost, overall or for the poor, have the drawbacks of the UNDP’s ‘human development’ measures and more, without the offsetting advantages. It may nevertheless prove feasible to develop (a) a table of correlates of incidence and intensity of vulnerability alone, and just possibly, based on this, (b) alpha-type measures of incidence, intensity and severity of *vulnerability* (of particular poverty groups) to specific types of DF. Section I includes a discussion of DF-risk measurement issues.

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<sup>66</sup>This is especially important to avoid misunderstanding poor people’s DFs and risks. The Turkish poor were specially exposed to residence and work near the earthquake faultline, and in weak buildings, in August 1999 because poverty constrained their options to earn a living. Within those constraints, and partly because of this high exposure, the poor probably chose low-risk portfolios. Only confusion arises from trying to ‘add up’ exposure and vulnerability into a total risk cost for the poor.

## ANNEX B

### MEASURING THE 'EXPOSURE' TO DFs OF A PARTICULAR PERSON OR GROUP

Exposure, vulnerability or aversion from DFs, or from a particular type of DF, can to some extent be assessed separately. Before asking how, it is helpful to recall why all three - or the damage from DFs due to all three - cannot be neatly summarised in a single variable.

1. The damage comprises the effects of exposure, vulnerability and aversion, and these are not commensurable. Of two people with the same exposure, one may have greater vulnerability; she will suffer more damage. Of two people with identical exposure and vulnerability, one may have higher aversion; he will suffer more damage, not only because he will adopt a less profitable (though safer) portfolio than his colleague, but also suffer greater psychological distress from the DFs as such, especially if they arrive only after a protracted period of uncertainty.
2. The normal measuring-rods of damage, such as income or consumption lost or foregone during a period of DF, are not only incomplete (excluding, for example, the distress caused by illness, or by relative decline from a previous adequate standard of schooling or clothing) but also, even in themselves, related to 'loss of well-being' in ways not well captured by a scalar measure. Therefore - though clearly some groups of people are much more exposed, vulnerable and averse to DFs than others - the search for a universal measure of total damage from DFs, allowing us to compare two groups precisely (or to rank nearby and apparently similar groups quantitatively), is chimerical. Why?
  - (a) Half as much consumption or income normally brings a person less than half as much satisfaction.<sup>67</sup> But how much less? It is common to answer this question by positing some sort of 'utility function' that, for most people (not for those who actually seek out risks), increases more slowly than consumption or income<sup>68</sup> - e.g. to treat utility or value as the logarithm of consumption. But there is no good way to choose among the infinite number of functions (including logarithmic ones) with this property. Observations on behaviour do not give strong guidance. More seriously, people with the same utility function locally may have very different functions globally; in other words, people in the same situation, and observed to behave the same way in preparing for, or responding to, small DFs that do not change that situation drastically, might require very different increases in mean consumption to persuade them to accept further rises in an already large DF.
  - (b) There is another reason why the damage from DFs to two persons, or groups, cannot be compared by using the 'measuring-rod of money' - consumption or income - or by translating money into utility via a utility function. That reason is the existence of thresholds that are distinct among persons. A downward fluctuation of \$10 a month in consumption per equivalent adult may well tip one household into food shortage that induces an infant death, while an apparently identical household is not pushed below this threshold, e.g. because its adult members can satisfy their basic needs with less food

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<sup>67</sup> That is why, if a person chooses among allocations of new money – among persons or over time - 'under the veil of ignorance' of what any individual will receive, he or she almost always opts for less fluctuation AND less inequality than prevails in previous allocations.

<sup>68</sup> This was the great contribution to risk analysis of Daniel Bernoulli in 1731[Bernstein, 1997].

because they have lower basal metabolic rates. This example is not fanciful - BMRs are known to vary among persons and groups, and there is evidence of thresholds of damage as food consumption falls (see fn. 31).

Though damage from DFs as a whole cannot be compared among groups with a single numerical indicator, partial measures are feasible and common. For example, the probable change in the age of death, and in liability to various diseases, due to changes in cigarette consumption can be quantified, and shown to vary among groups of persons according to the values of other variables measuring age-structure, diet, exercise, etc. It is now common to estimate the impact of changes in health-related variables on 'disability-adjusted life-years' or DALYs. Hence one can compare and rank the quantitative impact of different changes on DALYs for the same group of persons, or of the same change on DALYs for different groups of persons. If the cost of measures to bring about such changes is also known, one can then estimate whether it is more cost-effective to apply a particular set of measures to Group X than to Group Y; or, which of two sets of measures, with similar costs and political prospects, will do more to increase Group Y's health measure (DALYs). But more DALYs are simply the obverse of (a) fewer health DFs (into 'disability') and (b) later in life, i.e. for a given group rarer, occurrences of death, the final DF.

Many more examples can be given of measuring exposure to different sorts of DF. A policy that reduces such exposure more for a particular group, at the same cost, is a 'better' policy against DFs as a whole. But a policy that reduced vulnerability might be better and more cost-effective still: for some illnesses, cure can be almost painless and much cheaper than prevention. Even policies to reduce aversion might be best, though not those in this example (diseases due in part to smoking). Reducing aversion to a particular DF, without changing exposure or vulnerability need not (though it might) mean brainwashing. Instead, it might mean that people acquire better safeguards, more resilience, so they can seek income or pleasure despite being 'vulnerable' to associated DFs because they have greater confidence in treatment and recovery from the 'wounds'. Higher mean income reduces aversion from many economic risks, and may well be much more cheaply achievable than reducing exposure to those risks themselves.

Exposure to particular DFs (including risks) is often measurable, and measurement helps to allocate resources among policies and groups. However, the problems of measuring vulnerability, aversion, and especially total damage from DFs place limits on the scope for this approach.

**Table 1. Forms of exposure of different groups to different types of violence**

Exposed group	Wars/civil strife	Community violence*	Domestic violence
Adult males	Y (mortality, morbidity)	Y (mortality)	N
Women	Y (increased work burden in the absence of men, morbidity in relief camps)	Y (disruption of social networks)	Y (physical and mental abuse)
Children	Y (mortality when sent to war (Iraq/Iran, Sierra Leone); reduced public investments in social sectors, morbidity in relief camps)	Y	Y (child abuse)

Notes: Y – Exposed to violence  
N – Not exposed.

\* Community or Social Violence can be defined as violence that occurs between people not related by blood, marriage or common law. It tends to take place in the street or in public places and therefore is more visible than domestic violence. Definitions often focus exclusively on physical force [Morisson *et al.*, 1998].

**Table 2. Reported cases of domestic violence**

Location	Sample size	Percentage reporting violence	Type of violence	Source
Costa Rica		51*	Physical abuse	[Fischbach and Herbert, 1997]
Jalisco (Mexico)	1163 (rural) 1228 (urban)	44 (rural) 57 (urban)	Physical abuse	[Olavarrieta and Sotelo, 1996]
Kenya	733	42	Physical abuse	[Raikes, 1990]
Chile	222	80	Physical abuse (53 percent by partners, 16 percent by ex-partners and 11 percent by other family members)	[UN, 1985a]

Note: \* This is percentage of the sample.

**Table 3. Percentage of displaced under-5 year olds under 80 percent Harvard weight for height standard, Greater Khartoum**

	1990		1991	
	March	September	March	September
Kusha	5.2	18.4	12.2	15.1
Jebel Auliya	6.1	16.6	10.4	20.5
Muweleh	6.1	16.6	10.4	24.2
Zagallona I	4.0	13.9	10.4	16.3
Kalakala	4.4	13.9	10.4	16.3
Gamayer	2.3	11.1	12.2	13.9
Gadida	2.3	10.4	11.0	18.3
Zagallona	1.6	5.6	9.4	12.5

Source: Kuch [1993]

**Table 4. Damage caused by natural disasters (1970-89)**

Distribution of damage index (%)	Number of countries	Countries
<10	22	Djibouti, Malawi, Mozambique, Sudan, Tunisia ( <b>Africa</b> ); Belize, Cuba, Dominican Republic, Guadeloupe, Haiti, Mexico, Panama ( <b>North America</b> ); Argentina, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay ( <b>South America</b> ); Myanmar, Pakistan ( <b>Asia</b> )
10-19.99	10	Algeria, Botswana, Cape Verde, Gambia, Madagascar, Swaziland ( <b>Africa</b> ); Guatemala ( <b>North America</b> ); Laos, Nepal ( <b>Asia</b> ); Fiji ( <b>Oceania</b> )
20-29.99	9	Liberia, Mali, Niger, Senegal ( <b>Africa</b> ); St. Kitts & Nevis ( <b>North America</b> ); Afghanistan, China, Sri Lanka, Yemen ( <b>Asia</b> )
30-39.99	3	Antigua, Honduras, St. Vincent ( <b>North America</b> )
40-49.99	2	Mauritania, Mauritius ( <b>Africa</b> )
>50	14	Burkina Faso, Chad, Comoros, Ethiopia ( <b>Africa</b> ); Dominica, El Salvador, Jamaica, Nicaragua, St. Lucia ( <b>North America</b> ); Bolivia ( <b>South America</b> ); Bangladesh ( <b>Asia</b> ); Cook Is., Tonga, Vanuatu ( <b>Oceania</b> )
TOTAL	60	

Note: Damage index is calculated as  $\frac{\text{Damage (in US\$)}}{\text{Annual GNP}} \times 100$

Source: United Nations Environment Program [1993]

**Table 5. Major cities at risk**

City/conurbation	Country	Population 1980 (million)	Projected population 2000 (millions)	Hazard(s) to which exposed
Mexico City	Mexico	14.5	25.8	Earthquake
Tokyo – Yokohama	Japan	17.7	20.0	Earthquake
Calcutta	India	9.5	16.5	Cyclone, flood
Tehran	Iran	5.4	11.3	Earthquake
Jakarta	Indonesia	6.6	13.3	Earthquake, volcano
Rio de Janeiro	Brazil	9.2	13.2	Landslide
Shanghai	China	11.7	13.2	Flood, typhoon
Delhi	India	5.8	13.2	Flood
Dhaka	Bangladesh	3.4	11.2	Flood, cyclone
Cairo-Giza	Egypt	6.9	11.1	Flood, earthquake
Manila	Philippines	5.9	11.1	Flood, cyclone
Los Angeles	USA	9.5	11.0	Earthquake, landslide
Beijing	China	9.0	10.4	Earthquake

**Table 6. Why are the poor more exposed to disaster risks?**

Disaster type	Reasons why the poor are at greater risk than the nonpoor
Earthquakes	Residence near seismic fault-lines, inappropriate housing construction material
Volcanic eruptions	Poor live closer to volcanoes due to land pressures and land fertility
Landslides	Quality of housing of the poor
Droughts	Poor live on marginal lands and have weaker ability to time livestock sales in relation to market conditions; worse prior health of livestock; and limited ability to protect the herd, for example by buying fodder [Riely, 1992]
Floods	Poor do not have anywhere safe to go
Windstorms	Social restrictions affect women's ability to seek shelter and relief supplies [Begum, 1993] – female death rate from the 1991 Bangladeshi cyclone (71 per 1000) was many times more than male (15 per 1000) for 20-44 year olds [Chowdhury <i>et al.</i> , 1993] Flimsy housing – death rate amongst <i>kutcha</i> dwellers (108 per 1000) was nearly three times that amongst those living in brick houses (34 per 1000) in the 1991 Bangladesh cyclone. The death rate among those living in double storied buildings was zero [Chowdhury <i>et al.</i> , 1993].

**Table 7. Farming Impact of Drought in Burkina Faso and Ethiopia by Income Tercile**

	Burkina Faso		Ethiopia	
	Semi-arid Sahelian	Sudanian dry zone	Semi-arid lowland	Semi-temperate Upland
<b>Average kg/ha cereal yields in drought year as % of normal year</b>				
Poorest tercile	32	40	0	70
Richest tercile	29	51	10	65
<b>Crop output in drought year as % of normal year</b>				
Poorest tercile	20	55	2	91
Richest tercile	21	51	8	54
<b>Crop output \$ value in drought year as % of normal year</b>				
Poorest tercile	35	93	0	28
Richest tercile	42	71	14	42
<b>Output as grain equivalent, at local prices, in drought year as % of normal year</b>				
Poorest tercile	22	62	0	9
Richest tercile	26	48	5	12

Source: Calculated from Webb and Reardon [1992].

**Table 8. Poverty and income inequality per adult equivalent, Burkina Faso**

	Gini coefficient		Squared poverty gap	
	Normal year (1983-4)	Drought year (1984-5)	Normal year (1983-4)	Drought year (1984-5)
Sahelian – worst agroclimate	0.34	0.31	0.02	0.19
Sudanian	0.35	0.31	0.12	0.15
Guinean – better agroclimate	0.32	0.32	0.01	0.01

Source: Reardon and Taylor [1996]

**Table 9. Pro- or anti-poor inequality of income types, normal and drought years, Burkina Faso**

	Normal year (1983-4)			Drought year (1984-5)		
	Sahelian	Sudanian	Guinean	Sahelian	Sudanian	Guinean
Crop	0.19	0.19	0.25	0.18	0.21	0.19
Livestock	0.46	0.34	0.28	0.33	0.20	0.36
Off-farm	0.62	0.64	0.44	0.48	0.48	0.48
Migratory	0.38	0.86	0.48	0.37	0.55	0.20
Transfers	-0.06	0.18	0.01	-0.01	0.21	0.07

Source: Reardon and Taylor [1996]

Note: The Table shows values for the product of the income source Gini and the Gini correlation between the income source and the distribution of total income – this takes values between 1 when the income source is unequally distributed towards the rich and minus 1 when the income source is unequally distributed towards the poor.

**Table 10. Changes in income from 1983-4 to 1984-5 by source and tercile, Burkina Faso**

	Sahelian		Sudanian		Guinean	
	Poorest tercile	Richest tercile	Poorest tercile	Richest tercile	Poorest tercile	Richest tercile
Crop	-69	-58	-14	-21	-17	-1
Livestock	920	218	-213	-9	-34	98
Off-farm	-35	-41	32	-8	-21	2
Migratory	-46	34	N/a	-3	2459	-5
Transfers	N/a	43	-11	54	69	42
Total	-50	-20	-7	-13	-12	9

Source: Reardon and Taylor [1996]

**Table 11. Impact of 1988 flood on household medical costs by income, Bangladesh**

House type	House hold size	Pre-flood monthly income (Taka)	Monthly medical expenses (Taka)		
			Pre-flood	Post-flood	Change (%)
Brick floor and wall	7.0	7054	280	330	+ 18
Brick floor, metal wall	5.5	4790	240	277	+ 15
Mud floor, metal wall	5.9	4408	233	271	+ 16
Mud floor and thatched wall	4.9	2382	145	178	+ 23

Source: Islam [1997]

**Table 12 Mortality rates of under five year olds in urban areas, by migrants and non migrants**

	Period	Urban natives	Rural to urban migrants
<b>Latin America</b>			
Bolivia	1979-88	100.3	152.2
Ecuador	1977-86	44.3	80.0
Mexico	1977-86	62.0	60.3
Peru	1976-85	54.6	110.5
<b>North Africa</b>			
Egypt	1979-88	93.5	94.3
Morocco	1977-86	75.9	88.0
North Sudan	1979-88	108.9	134.4
Tunisia	1978-87	67.0	80.3
<b>Sub-Saharan Africa</b>			
Ghana	1978-87	152.1	115.6
Kenya	1979-88	74.7	59.2
Mali	1977-86	200.0	213.3
Senegal	1976-85	70.8	133.5
Togo	1978-87	119.9	125.7
Uganda	1979-88	167.9	146.9
<b>South-East Asia</b>			
Indonesia	1977-86	84.4	86.6

Source: Brockerhoff [1995]

**Table 13. Privately-provided DF/risk management strategies**

<b>DF/Risk</b>	<b>Privately-provided Management Strategy</b>
Conflict	* Informal social welfare (neighbourhood help, children in foster homes, remittances)
Disasters	* Informal precautionary savings and investment in human capital (high fertility) and social capital (marriage and other networks that provide help)
Harvest	* Income diversification * Use of risk-reducing inputs * Delay sowing * Plot diversification * Choosing low-return enterprises with lower risks
Health	* Reducing exposure to health risk, if causes known * Holding precautionary savings * Investing in social capital that provide labour, food and care
Labour	* Informal social welfare (neighbourhood help, children in foster homes, remittances) * Informal precautionary savings and investment in human capital (high fertility) and social capital (marriage and other networks that provide help)
Price	* Income diversification * Establishing contact/informal relationships with outstation buyers * Increased production for home consumption

Source: Zeller [1999]

**Table 14. Types of Insurance by DF/risk sharing benefit**

<b>Source</b>	<b>Type of Insurance</b>	<b>Type of DF/Risk Sharing Benefit</b>
<b>Informal Economy</b>		
Family	Personal needs through intra-family lending	Family Security
Village	Personal and small enterprise through moneylenders/friends	Mutual aid
Informal business	Micro-enterprise development through co-signing by groups	Group risk-sharing
<b>Formal Economy</b>		
Savings and Credit Co-operative or Credit Union	Small consumer loan Accumulated savings Home improvement	Group risk-sharing; Death/disability benefit Life insurance Limited property insurance
Commercial Sector	Small and bigger business Housing Builders Business operations Life Retirement Health	Liability Insurance Mortgage Insurance Employee benefits Death Benefits Pensions/annuities Health Insurance
Government	Health, old age and disability benefit Unemployment	Social Security Unemployment Insurance

Source: Matin [1999]

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