Measuring Vulnerability in Developing Countries

New Analytical Approaches

Edited by
Wim Naudé,
Amelia U. Santos-Paulino
and **Mark McGillivray**

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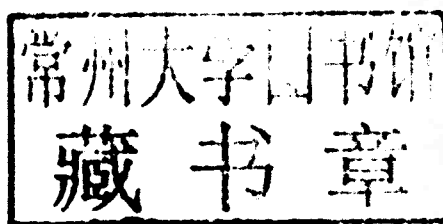
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Measuring Vulnerability in Developing Countries

In all of the major challenges facing the world currently, whether it be climate change, terrorism and conflict, or urbanization and demographic change, no progress is possible without the alleviation of poverty. New approaches in development economics have in recent years started from the premise that we cannot successfully deal with poverty unless we also deal with vulnerability—but not only vulnerability to income poverty but also vulnerability to various others hazards—such as climate, conflict, macro-economic shocks and natural disasters.

This book provides insights into new approaches in conceptualizing and measuring vulnerability. It includes chapters dealing with advanced issues such as the compilation of economic vulnerability indices (EVIs) on a macro-level, of conceptualizing and measuring local vulnerability across regions in a country, and of measuring the flip-side of vulnerability, namely resilience. The book also explores the sensitivities of the various measurements of vulnerability to vulnerability lines, poverty lines, and permanent income, with consideration to some of the most vulnerable groups in developing countries. Overall, the contributions in the book consolidate new approaches as far as the concept and measurement of vulnerability on different levels and outcomes are concerned, and note directions for future research.

This book was published as a special issue of *Oxford Development Studies*.

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Contents

Measuring Vulnerability: An Overview and Introduction

WIM NAUDÉ, AMELIA U. SANTOS-PAULINO & MARK MCGILLIVRAY

ABSTRACT   *This paper provides an introduction to this special issue of* Oxford Development Studies. *It starts by contextualizing the measurement of vulnerability, pointing to the need to take risks on the level of households, regions and countries into account in designing poverty-reduction strategies. It then summarizes the papers in this special issue, highlighting the ways in which they advance the conceptualization and measurement of vulnerability, and noting directions for future research.*

1. Introduction

In all of the major challenges currently facing the world, whether they are climate change, terrorism and conflict, or urbanization and demographic change, no progress is possible without the alleviation of poverty. In recent times, development studies have advanced to the stage where it is clear that we cannot successfully deal with poverty unless we also deal with vulnerability. Where poverty was initially associated exclusively with inadequate income (or consumption) in a static manner as an *ex post* measure of development, it is now understood as a multidimensional and dynamic concept. A strong case can be made that proper policies and strategies to deal with poverty need to be forward looking (*ex ante*) and be concerned with the various risks that affect whether individuals or households are in poverty, or are likely to fall into poverty[1] (e.g. Holzmann & Jorgensen, 2000). Moreover, it is not just vulnerability to poverty that matters: it is often claimed that

not only vulnerability to income poverty but also vulnerability to various other hazards— such as climate, conflict, macroeconomic shocks and others—has increased.[2] As a result, there have been important advances in the literature, specifically in moving towards a broader but also more operational concept of vulnerability.

In addition to broadening the concept of vulnerability, the methods and scope of measurement of vulnerability towards various hazards have also seen advances in recent years. In particular, the concept of vulnerability is recognized as being relevant on the level of socio-economic groups, places and across time (Turvey, 2007). Various efforts are now underway attempting to measure vulnerability not only on a household level, but also on the level of countries, regions and local areas (Naudé *et al.*, 2008, 2009).

Recognition of the importance of taking into account vulnerability in addressing the problem of poverty is therefore a recognition that various risks exist on various levels of group, place and period, which hinder progress in development. Conceptualizing and measuring these are prerequisites for strengthening the ability of households, regions and countries to cope with risk, and prosper even in spite of being vulnerable.

The papers in this special issue provide insights into advances in conceptualizing and measuring vulnerability, in particular household vulnerability to poverty and country and regional vulnerability to external shocks. The aim of the papers collected here is therefore to consolidate the current state of the art as far as the concept and measurement of vulnerability on different levels and outcomes are concerned, and to note directions for future research. The remainder of this overview paper is structured as follows. In the next two sections we offer, as background to the special issue, short overviews of the concept and the measurement of vulnerability in development studies. Thereafter, we provide an introduction to the five papers contained in this issue.

2. The Concept of Vulnerability[3]

Given the recognition that vulnerability is relevant across various outcomes and levels, a general definition sees vulnerability as the risk that a "system", such as a household, region or country, would be negatively affected by "specific perturbations that impinge on the system" or to the probability of a "system" undergoing a negative change due to a perturbation (Gallopin, 2006, p. 294).

Different scientific disciplines have different specific definitions of vulnerability because they focus on different components of risk (Alwang *et al.*, 2001). For instance, the International Strategy for Disaster Reduction (ISDR) defines vulnerability as "the set of conditions and processes resulting from physical, social, economic, and environmental factors, which increase the susceptibility of a community to the impact of hazards" (ISDR, 2004, p. 16). In economics, vulnerability has often been defined as the risk of households falling into or remaining in poverty because of either idiosyncratic hazards (due to characteristics of the individual household) or covariate/aggregate hazards (external to the household) (e.g. Dercon, 2005, p. 10). By focusing on hazards, and not just transient poverty but the probability of remaining in poverty (chronic poverty), it takes into account "both exposure to serious risks and defenselessness against deprivation" (Kamanou & Morduch, 2004, p. 155).

From the common definitional elements it is clear that vulnerability relates *to* an undesirable outcome (e.g. vulnerability *to* poverty, vulnerability *to* food insecurity or vulnerability *to* natural hazards) and that such vulnerability is due to "exposure to

hazards", which cause "perturbations" (Alwang *et al.*, 2001, p. 6). These hazards can have many origins: environmental, socio-economic, physical and political. It is also clear that the "system" can imply different spatial levels of analysis that exhibit vulnerability, from micro (household), to meso (regional) and macro levels (countries, the globe).

Given that vulnerability can exist on different spatial levels and in reference to a wide variety of potential hazards, it is no surprise that there are many ways in which to measure vulnerability. The papers in this issue discuss some of the best-known measures, in particular those now pioneered in economics. We shall not therefore go into the detail of these measures here. However, given that the number of vulnerability measures may multiply in the future (especially as better data become available), it may be useful to point out here that there are several criteria that a sound measure of vulnerability should ideally satisfy.

The first is that vulnerability is an *ex ante* notion, so that any measure of vulnerability should have a "predictive quality" (Cannon *et al.*, 2003). Second, measures of vulnerability should define vulnerability in relation to a socially acceptable level of outcome (Alwang *et al.*, 2001, p. 33). Third, vulnerability indicators should ideally contain information on the causes of vulnerability and the relative importance of idiosyncratic and covariate risk (Günther & Harttgen, 2006). Fourth, a good measure of vulnerability should refer to a particular cause of vulnerability, i.e. be hazard-specific (Cannon, 2007). Fifth, to measure vulnerability appropriately, one needs to consider the dynamics of vulnerability not only before a hazard occurs, but also during and after (Birkmann, 2007). Finally, sixth, vulnerability cannot be properly assessed without assessing a system's ways and means of coping with risk. The term "resilience" is often used to denote a system's response to hazards/coping mechanisms (see the paper by Briguglio *et al.* in this issue).

3. Measuring Vulnerability

In the literature on the economics of poverty, three main methods of measuring vulnerability to poverty are to see vulnerability as (1) uninsured exposure to risk, (2) expected poverty, or (3) low expected utility (Günther & Harttgen, 2006, pp. 3–4). What these methods have in common is that they express vulnerability as being determined by the expected mean and variance of a household's income or consumption. Recent overviews of these methods are contained in Hoddinott & Quisumbing (2003), Ligon & Schechter (2003), Dercon (2005) and Günther & Harttgen (2006).

Economists have also been concerned to measure vulnerability from the perspective of resilience. Here *ex ante* and *ex post* coping strategies have been distinguished. *Ex ante* households often attempt to diversify their sources of incomes, and *ex post* a negative event often relies on various forms of insurance (see e.g. Fafchamps, 2003; Dercon, 2005). Generally, household assets or endowments play an important role in coping strategies or resilience and therefore much effort has gone into measuring these. These assets include natural assets (e.g. land), physical assets (e.g. infrastructure), financial assets (e.g. insurance, savings), human assets (e.g. know-how, health) and social assets (e.g. networks). The role of assets in coping has also been studied in other disciplines, and is prominent in the sustainable livelihoods approach (SLA) (see e.g. Moser, 1998). In fact, the analysis of assets as broadly defined here in the SLA approach generally starts out from the influential definition of Chambers & Conway (1992, p. 7) of sustainable livelihoods

as living that can "cope with and recover from stress and shocks". Policies and programmes to promote sustainable livelihoods therefore have much in common with policies and programmes to reduce vulnerability (Cannon *et al.*, 2003).

Outside economics, much advance has been made in measuring vulnerability towards natural hazards (see e.g. Birkmann, 2006). In this literature, a common approach is to measure vulnerability as the degree of risk a particular household/population/region/ country faces. Thus, risk is seen as a function of hazard and vulnerability. Various indicators are used to measure hazard potential (such as the occurrence of droughts, fires, earthquakes, floods) and vulnerability (such as GDP, population density, sensitive environments). Often, indicators of community resilience are added, such as levels of education, infrastructure and assets. The selection of appropriate indicators depends on the spatial level under study as well as the availability of appropriate data. Briguglio (2001) discusses a number of methods to compile a vulnerability "index": these range from normalizing variables and taking their averages, to mapping variables on a categorical scale, to using regression methods to estimate predicted values for an index. Various vulnerability indices on the country level have been proposed since UN-DESA initiated work on the vulnerability of small island states in the early 1990s. For instance, the Commonwealth Vulnerability Index (CVI) consists of three indicators: export dependency, export diversification and susceptibility to natural disasters (Easter, 1998). The Inter-American Bank developed a Prevalent Vulnerability Index (PVI) consisting of the averages of three composite indicators for exposure or physical susceptibility, fragility and resilience. One of the most extensive vulnerability indices is the Environmental Vulnerability Index developed by UNEP and the South Pacific Applied Geoscience Commission (SOCAP), which uses over 50 indicators covering a large number of dimensions of vulnerability and resilience.

4. Overview of the Special Issue

The papers in this special issue proceed by focusing on vulnerability from macro-level to micro-level perspectives. The first paper, "An Economic Vulnerability Index: Its Design and Use for International Development Policy" by Patrick Guillaumont, starts out by noting that there has been a renewed interest in what he terms "macro vulnerability" during the past decade or so. Reasons for this interest are to be found in rising concerns about fragile states, the persistence of poverty in Africa and the Asian crisis in the late 1990s as well as the recognition that certain groups of countries, in particular Small Island Development States (SIDS) (see also McGillivray *et al.*, 2008a, b), are inherently more vulnerable to external shocks. Interest has also been fuelled by the fact that household-level vulnerability to poverty results "to a large extent from macro vulnerability". Recent events such as increases in fuel and food prices and global financial instability add to the concerns about macro vulnerability.

Guillaumont proceeds to discuss the historical background to one of the earliest and perhaps best-known macro-level vulnerability indices, namely the United Nations Economic Vulnerability Index (EVI). This index is described as an attempt to derive an internationally comparable measure of vulnerability to inform international development policy. According to Guillaumont, the "economic vulnerability of a country can be defined as the risk of a (poor) country seeing its development hampered by the natural or external shocks it faces". This indicates that in this view there are two main sources of vulnerability

faced by countries: (1) environmental or natural shocks such as natural hazards; and (2) external shocks related to trade and international prices. How vulnerable a country is to these would depend on: the size and frequency of these shocks; the degree of exposure to these shocks; and the capacity of the country to react to these shocks. From this he suggests that one should distinguish between structural economic vulnerability (which is exogenous) and state fragility (which is vulnerability due to inappropriate policies, institutions and weak governance).

Guillaumont discusses further the components of the UN EVI, which is a composite index calculated from seven component indices. Four of these are used to construct a "shock" index and three to construct an "exposure" index. The EVI is an equal weighting of the shock and exposure indices. The shock index consists of measures of homelessness due to natural disasters, instability of agricultural production and instability of exports. The exposure index consists of measures of population size, remoteness and specialization. Finally, Guillaumont discuss ways in which this EVI can be used for international development policy, in particular to improve aid effectiveness. He notes that further research is required on the relationship between structural vulnerability and state fragility, and suggests that measures of structural vulnerability can be used to inform aid allocation, while measures of state fragility may determine the modalities of aid provision.

The second paper in this special issue is by Lino Briguglio, Gordon Cordina, Nadia Farrugia and Stephanie Vella, and is titled "Economic Vulnerability and Resilience: Concepts and Measurements". The aim of this paper is to extend work on measuring macro vulnerability by proposing a definition and measure of "economic resilience". In line with developments in the vulnerability to natural hazards literature (see e.g. Wisner *et al.*, 2004), the authors see the concept of economic resilience as being linked inextricably to the concept of economic vulnerability. They define economic vulnerability as the "exposure of an economy to exogenous shocks, arising out of economic openness". For them, economic resilience is therefore the "policy-induced ability of an economy to withstand or recover from the effects of such shocks".

The concern of this paper is to be able to conceptualize and measure economic resilience better. This arises from the observation that many countries that are apparently highly vulnerable manage to achieve high and stable economic growth. Briguglio has called this the "Singapore Paradox" in reference to this small island state's remarkable development performance in the face of high vulnerability to external shocks. According to the authors, the way to understand the Singapore Paradox is to note that such countries have adopted appropriate policies and institutions to help them cope with the effects of what is called "inherent" vulnerability (which is similar in concept to Guillaumont's notion of "structural vulnerability"). In essence, such countries have policies and institutions in place that strengthen their economic resilience.

Distinguishing between vulnerability and resilience has a number of conceptual and practical advantages, according to Briguglio *et al.* One is that it allows a vulnerability index to be constructed that measures the permanent or exogenous ("structural") factors that determine a country's economic vulnerability and does not measure "self-inflicted vulnerability" (or state fragility). Another is that a resilience index can then be constructed to show what a country can do to adapt to and mitigate sources of inherent/structural vulnerability. From this it follows that risks facing a country have two elements: the first

associated with the inherent or structural conditions (vulnerability or exposure) and the second with the ability to cope with adverse shocks (resilience or coping ability).

In their paper, Briguglio *et al.* discuss the components of an Economic Vulnerability Index and of a resilience index. For the former they propose measures of economic openness, export concentration and dependence on strategic imports. For the latter they propose measures of macroeconomic stability, microeconomic market efficiency, good governance and level of social development. They conclude by finding from a cross-section of countries that GDP per capita has a positive association with economic resilience.

The third paper by, Wim Naudé, Mark McGillivray and Stephanié Rossouw, is titled "Measuring the Vulnerability of Subnational Regions in South Africa", and moves from the macro level of the previous papers to the meso level. They begin their paper by pointing out that in contrast to the growing literature on macro vulnerability, and the substantial literature on household vulnerability to poverty, less attention has been paid to the economic vulnerability of different regions within countries, i.e. subnational (or meso) vulnerability. This is a weakness as regional-level shocks to income, or regional-level government capacity and actions, can be a source of covariate risk to household income.

They proceed by addressing this shortcoming by providing an example of a Local Vulnerability Index (LVI) by using data from South Africa. Moreover, they condition their LVI on income per capita (often a measure of resilience, as discussed in the paper by Briguglio *et al.*) and from this they define a Vulnerability Intervention Index (VII). It is argued that this index is potentially useful as it could indicate where higher income per capita may be unlikely in itself to reduce vulnerability. In effect, then, they qualify the extent to which income per capita is useful as a measure of resilience. Also, they discuss the inclusion of environmental and geographical indicators in their LVI, factors that are typically omitted in EVIs. They conclude by showing that when applied to the South African case, remoteness, dominance of primary (agricultural) production in a local economy, and low population densities particularly characterized the subnational districts with both high vulnerability and a high VII. The policy implication is that addressing vulnerability in these places would require interventions that extend beyond merely raising per capita incomes.

In the fourth paper we move from the meso level to the micro level, to focus on household vulnerability to poverty. In their paper titled "How Precisely Can We Estimate Vulnerability to Poverty?", Yuan Zhang and Guanghua Wan start out by recognizing that there are a number of definitions of "vulnerability to poverty". As they discuss, it could, for instance, be defined as "the propensity of a household to suffer a significant shock which brings its welfare below a socially accepted level" (Kühl, 2003). It can also be defined as "the probability that a household would experience at least one episode of poverty in the near future" (e.g. Mansuri & Healy, 2001), or as "the probability that a household at period t becomes poor at time $t + 1$ (e.g. Chaduri *et al.*, 2002).

Each of these definitions of household vulnerability to poverty has generated alternative measurement methods. Zhang and Wan discuss these methods in order to emphasize that "To date, no preferred definition of or measurement methodology for vulnerability to poverty has been agreed on". They then proceed to clarify the literature by exploring the sensitivities of the various measurements of vulnerability to: (1) vulnerability lines, (2) poverty lines and (3) techniques for estimating permanent income. For this they use household survey data for 1989, 1991 and 1993 from the China Health and Nutrition

Survey. They estimate household vulnerability using 1989 and 1991 data and from this predict vulnerability to poverty, comparing their predictions with the actual situation in 1993. Their premise is that "the closer the predicted vulnerability is to actual poverty, the better the measurement technique is". They find that it is better: (1) to set the vulnerability line at 50%; (2) to use past average income as an estimate of permanent income; and (3) to use a higher poverty line (US$2 rather than $1) in order to improve the measurement of household vulnerability to poverty.

Finally, the fifth paper in this special issue, by Tilman Brück and Kati Schindler, titled "The Impact of Violent Conflicts on Households: What Do We Know and What Should We Know about War Widows?", remains with the micro or household level of analysis, but sharpens the focus of traditional vulnerability analyses by asking how we should understand vulnerability in extreme contexts—such as when households are affected by mass violent conflict. They argue that this is vitally important, especially in regions such as Africa, where "armed conflict is arguably now the single most important determinant of poverty". Although their paper is focused specifically on the case of war widows in Rwanda, it raises important general issues that are valuable for understanding and measuring vulnerability, particularly as not much is known about how mass violent conflict and the legacy of conflict affect household vulnerability. They show from the Rwandan experience that violent conflict is likely to have a strong impact on household boundaries, activities and intra-household relations, including gender roles, which may transform significantly the core functions of households—and the risks a household face. From their Rwandan case study they find that widows face "different and often more severe constraints in earning a livelihood than other vulnerable individuals in Rwanda owing to their loss of social and economic networks that mirror the conflict divide". As more and more countries (hopefully) end mass violent conflict, it would be important for post-conflict poverty reduction strategies to bear in mind the particular vulnerabilities that such conflict creates.

5. Concluding Remarks

Research on vulnerability, in many scientific disciplines, is clearly gaining salience as a field. These disciplines include the social sciences and economics in particular, where the initial narrower focus on static, income-poverty measures of well-being is making way for a myriad of more complex and relevant assessments—across outcomes and levels.

The topics covered in this special issue provide a useful illustration of the range of current research on conceptualizing and measuring vulnerability. It is hoped that each of its papers will stimulate further research along similar lines. Above all, it is hoped that these papers will contribute to the design and implementation of more effective strategies aimed at reducing vulnerability at all levels—household, regional and national.

Notes

[1] Most of the traditional measures of poverty, including those used to define some of the Millennium Development Goals, only weigh the current poverty of a household, with no regard for the probability that a household might fall into poverty in the future.

[2] Wisner *et al.* (2004, p. xv) argues that vulnerability is increasing "despite the best efforts of many scientists, policymakers, administrators and activists".

[3] This section and the next draw on Naudé *et al.* (2009).

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An Economic Vulnerability Index: Its Design and Use for International Development Policy

PATRICK GUILLAUMONT

ABSTRACT *In response to a need expressed by the UN General Assembly, an Economic Vulnerability index (EVI) has been defined by the Committee for Development Policy. The present paper, which refers to this index, first examines how a structural EVI can be designed for low-income countries in particular. It recapitulates the conceptual and empirical grounds of the index, considers the structure of the present EVI, its sensitivity to methodological choices with respect to averaging, as well as possible improvements in this regard, and briefly compares the levels and trends of EVI in various country groups, using a new database from a "retrospective EVI". The paper examines how the EVI can be used for international development policy, underlining two main purposes. The first—the purpose for which the EVI was initially designed— is the identification of the least-developed countries (LDCs) that are eligible to receive some preferential treatment in aid and trade matters. The EVI, in addition to income per capita and human capital, is one of three complementary criteria a country needs to meet in order to be designated as an LDC, and consequently it cannot be the sole criterion for countries wishing to avoid graduating from the LDC list. Second, the EVI can be used, in addition to other traditional measures, as a criterion for aid allocation between developing countries. It is argued that such an inclusion is legitimate for reasons of both effectiveness and equity. The two purposes are presented as complementary.*

1. Introduction

The economic vulnerability of developing countries is not really a new issue. If we consider the development literature of 40 years ago, the issue of instability, especially for primary exports and international prices, made up a significant part of the analysis of the problems faced by developing countries. Recently, the economic vulnerability of developing countries has again appeared to be high on the international agenda, even higher now with the onset of global economic turmoil.