UNITED NATIONS UNIVERSITY
UNU-WIDER
World Institute for Development Economics Research

Research Paper No. 2008/99

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

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November 2008

Abstract

In response to the 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 economic vulnerability index can be designed for the low-income countries in particular. It recalls 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 related possible improvements, 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 EVI can be used for international development policy, underlining two main purposes: first—the purpose for which EVI was initially designed—is the identification of the least developed countries (LDCs) that are allowed to receive some preferential treatment in aid and trade matters. EVI, in addition to income per capita and human capital, is one of the three complementary criteria a country needs to meet in order to be perceived as a LDC, and consequently it cannot be the sole criterion for countries wishing to avoid exiting the LDC list. And second, EVI is to be used, in addition to other traditional measures, as a criterion for aid allocation between developing countries. We argue that such an inclusion is legitimate for both reasons of effectiveness and equity. The two purposes are presented as complementary.

Keywords: vulnerability, aid allocation, human capital, least development countries
JEL classification: F35, N10, I39

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This is a revised version of a paper originally prepared for the UNU-WIDER conference on Fragile States–Fragile Groups, directed by Mark McGillivray and Wim Naudé. The conference was jointly organized by UNU-WIDER and UN-DESA, with a financial contribution from the Finnish Ministry for Foreign Affairs.

UNU-WIDER gratefully acknowledges the contributions to its project on Fragility and Development from the Australian Agency for International Development (AusAID), the Finnish Ministry for Foreign Affairs, and the UK Department for International Development (DFID). Programme contributions are also received from the governments of Denmark (Royal Ministry of Foreign Affairs), Norway (Royal Ministry of Foreign Affairs) and Sweden (Swedish International Development Cooperation Agency—Sida).

ISSN 1810-2611 ISBN 978-92-9230-153-8

Acknowledgements

This paper presented at the opening session of the UNU-WIDER Conference on Fragile States–Fragile Groups**,** Helsinki, June 2007, relies on research done by the author in collaboration with UN-DESA and leading to a forthcoming publication on the least developed countries (Guillaumont 2008b). Special acknowledgement is due for the tables to Martine Bouchut at CERDI and Charles Milenko at UN-DESA.

A list of acronyms is given at the end of the paper.

Tables are at the end of the paper.

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Typescript prepared by Liisa Roponen at UNU-WIDER

1 Introduction

Economic vulnerability of developing countries is not really a new issue. If we consider the development literature of forty years ago, the issue of instability, especially for primary exports and international prices, made up a significant part in the analysis of the problems faced by developing countries. Recently, the economic vulnerability of developing countries again appears to be high on the international agenda.

Several trends and events may have contributed to this renewed interest in macro vulnerability in the last decade. The unsustainability of growth episodes in Africa has become a major intellectual and political challenge. In particular, the problem of conflicts, acute in Africa, has drawn the attention of the international community to the risk of civil wars, often lasting or recurrent. It is mainly in reference to these situations and other possible sources of collapse that new concepts—such as 'LICUS' (low-income countries under stress) or 'fragile states'—have emerged. These concepts, however, differ significantly from economic vulnerability, as will be shown below.

Moreover, in the second part of the 1990s, the 'Asian crisis' underlined the vulnerability of some emerging countries which had registered before the crisis a high level of capital inflows with a weak financial structure. This led several authors to assess the risk of a financial crisis, a measure of vulnerability, but one that also differs from the vulnerability of low-income countries considered below. It is also to be noted that the concern over the instability of international commodity prices has become deeper due to their possible greater impact on producers in a context of liberalized domestic agricultural markets. Initiatives have been made to propose ways in which commodity-dependent economies can better manage the risks they face in a market-based approach. And more generally, the attention focused on vulnerability at the household level that has emerged in connection with poverty-related research, has also reinforced interest on macro-level vulnerability because vulnerability of households results to a large extent from macro vulnerability.

Two main factors have not only contributed to the growing concern over macro vulnerability, but have also prompted the search for a vulnerability index, which could be comparable across countries and could likely be used in designing international development policies. These correspond to the international concern regarding the structural features of specific country-groups, and have been voiced in various United Nations meetings and resolutions. Two groups of countries thus have been considered with respect to vulnerability. The first group, and the only official one, is the category of the least developed countries (LDCs), set up by the UN General Assembly in 1971. The second, a more informal group, is 'small island developing states' (SIDS). On the part of both groups, there is a need to be able to assess the vulnerability of these countries through an appropriate indicator.

First, the SIDS have repeatedly expressed a concern about their level of vulnerability, as voiced at the 1994 Barbados Conference on Sustainable Development of Small Island Developing States. Following this Conference that called for 'the development of vulnerability indices and other indicators that reflect the status of small island developing countries and integrate ecological fragility and economic vulnerability', the UN General Assembly requested in 1996 the Secretary General to prepare a report on the vulnerability index and the Committee for Development Planning (CDP) to examine this index. In 1998, the UN Commission on Sustainable Development urged the CDP to

present its findings and for other UN bodies to accord priority to the work on the vulnerability of SIDS. In 1999, after considering several available indicators, the Committee for Development Policy (the CDP renamed) proposed a new and relatively simple index (UN 1999) which was elaborated further at the following CDP sessions. Ten years after the Barbados Conference, the Mauritius Conference (December 2004) reiterated the concern of the international community about the vulnerability of small islands. Few days later, the tsunami confirmed the relevance of this concern.

Second, in accordance with CDP's own suggestion, the General Assembly requested the committee to consider 'the usefulness of the vulnerability index as a criterion for the designation of the least developed countries'. Since the category was established, the LDCs have been considered as low-income countries suffering from structural handicaps to growth. Initially, in addition to the level of income per capita, the criteria used to capture structural shortcomings were the literacy rate and the share of manufacturing in GDP. These were replaced in 1991 by two composite indices, one referring to human status, the other to economic diversification. In 1999, as noted above, the CDP proposed that in addition to the level of GDP per capita and an index of human capital, the new *economic vulnerability index* (EVI) should replace the diversification index as one of the criteria for identifying LDCs. In 2000 at its triennial review of the LDCs list, CDP implemented the EVI index as an identification criterion, utilizing it again in 2003 and 2006 with some revisions. This new vulnerability criterion, initial and revised versions, has been recognized by ECOSOC.

The economic vulnerability of a country can be defined by the risk of a (poor) country seeing its development hampered by the natural or external shocks it faces. Here we consider two main kinds of exogenous shocks, thus two main sources of vulnerability: (i) environmental or 'natural' shocks, namely natural disasters such as earthquakes or volcanic eruptions, and the more frequent climatic shocks such as typhoons and hurricanes, droughts, floods, etc., and (ii) external (trade- and exchange-related) shocks, such as slumps in external demand, world commodity prices instability (and correlated instability of terms of trade), international fluctuations of interest rates, etc. Other domestic shocks may also be generated by political instability or, more generally, by unforeseen political changes. These shocks, however, are not considered here, in as far as they seem less 'exogenous'.

Vulnerability can be perceived as the result of three components:

i) the size and frequency of the exogenous *shocks*, either observed (ex post vulnerability) or anticipated (ex ante vulnerability);

ii) *exposure* to shocks;

iii) the capacity to react to shocks, or *resilience*.[1] Resilience depends more on current policy, is more easily reversed, and is less structural. But there may also be a structural element in the resilience component of vulnerability.[2]

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1 The concept of resilience is largely used in certain works more specifically oriented towards the environmental or natural sources of vulnerability (cf. Kaly et al. 1999).

2 A distinction close to this three component one is given in Rodrik (1999) who, in looking at the risk of social conflict in countries facing external shocks, considers the individual severity of the shocks, the depth of latent social conflict (likely to increase the impact of the shocks), and the quality of conflict management institutions.

Thus, a distinction can be made between *structural vulnerability*, which results from factors that are independent of a country's current political will, and the *vulnerability deriving from policy*, which results from recent choices. For instance, the vulnerability of the Asian countries in the mid-1990s after the 1997 crisis is very different from the vulnerability of small economies or that of small islands that export raw materials. It is less structural, more the result of policy, thus more transient. This feature is clearly evident when vulnerability is measured according to the probability of a financial crisis that can be estimated mainly from financial and policy variables (see, for instance, Berg and Patillo 1999; Goldstein, Kaminski, and Reinhart 2000). If a vulnerability index is to be used in selecting certain countries for the allocation of long-term support by the international community, what needs to be measured is naturally the structural vulnerability, which essentially results from the size of the shocks that can arise and exposure to them.

It also follows that structural economic vulnerability should be clearly distinguished from *state fragility*. As was evidenced in several papers presented at the June 2007 UNU-WIDER conference, fragile states are defined—as are the LICUS—according to policy indicators, essentially the World Bank's country policy and institutional assessment (CPIA). Fragile states are (developing, but low-income only occasionally) countries having with a (very) low policy score.[3] Of course, many countries may meet both criteria of *structural vulnerability* as well as *state fragility*, due to the likely influence of the former on the latter, but the two concepts are founded on opposite grounds, structural versus policy factors, and cannot be used in the same way to design international policies, as we shall see below for aid policies.

Finally, for the purpose of this paper, another distinction needs to be done between economic vulnerability and *ecological fragility*. The UN's initial concern over vulnerability included both economic vulnerability and ecological fragility, but it quickly became clear that the two concepts should be analysed separately. For instance, losses in biodiversity reflect ecological fragility and are not necessarily major elements of economic vulnerability. The ad hoc expert group on vulnerability commissioned by the UN clearly recognized this difference (which was reaffirmed by the CDP), while also acknowledging that economic vulnerability could be induced by natural factors, i.e., by the environment ('the relative susceptibility of economies to damage caused by natural disasters', UN 1999). Thus, environmentally-induced economic vulnerability can be considered either as economic vulnerability or ecological vulnerability.[4]

The EVI, as designed by the CDP, is clearly an index of structural economic vulnerability and is considered here as such. It relates to structural factors—not policy factors—that are beyond the present control of the country and which also influence

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3 For instance, belonging to the bottom two quintiles of the CPIA or with no CPIA for the Development Assistance Committee of the OECD.

4 The most comprehensive attempt to build an 'environmental vulnerability index' was undertaken by SOPAC (South Pacific Applied Geoscience Commission) (cf. Kaly et al. 1999). In May 1999, the CDP considered several available indicators (the Commonwealth Secretariat composite vulnerability index, the Caribbean Bank economic vulnerability index, and the SOPAC environmental vulnerability index), before proposing a new and relatively simple index of economic vulnerability (UN 1999). In 2000, assessing the implementation of the outcome of the Barbados Conference, the GA (A/55/185) presented its own review of the several attempts to build a vulnerability index 'for small island developing states', a review which, to a large extent, focused on environmental issues.

global vulnerability, mainly through resilience. EVI has been designed to identify the nations among the low-income countries that are the most disadvantaged by structural handicaps to growth.

It should be mentioned that EVI, for usage in identifying the LDCs, is measured for a larger set of countries than merely for this particular group, thus it encompasses not only other low-income but also middle-income countries. It is, therefore, conceivable that EVI can also be applied to other purposes where the measurement of this structural handicap would appear useful. We argue that this is noticeably the case in searching for relevant aid allocation criteria.

In the next sections of this paper we consider successively three issues:

- what is the conceptual and empirical basis for an economic vulnerability index?
- how can a structural economic vulnerability index be designed for the low-income countries in particular, and has it been done by the CDP?
- how can such an economic vulnerability index be used in connection with international development policy, particularly for the identification of the LDCs and for aid allocation?

2 Conceptual and empirical basis of an economic vulnerability index

Let us very briefly review the reasons why economic vulnerability is detrimental to development (see Guillaumont 2006, 2008b). We refer to the dynamic definition of vulnerability—the risk that economic growth is markedly and extensively reduced by shocks. According to another somewhat broader dynamic definition, risk is the likelihood of negative and lasting effects on poverty reduction from shocks.

We first examine the links between vulnerability and growth with reference to the three main components of vulnerability identified above (shocks, exposure and resilience), and then add few words on the direct effects on poverty.

Shocks: the negative impact of instability on growth

There is not much debate about the negative impact of 'one-sided' natural shocks such as earthquakes, typhoons, or floods. The damage is often huge, first in terms of the number of deaths, and second in the destruction of physical capital. Rather, the debate concerns the measurement of the size of these losses. But many shocks—particularly external ones—are 'two-sided' (up-and-down cycles). The very nature of instability is a succession of booms and slumps (of export prices, external demand, rainfall, etc.). This is why in assessing vulnerability over a long period it is more appropriate to consider the impact of instability or volatility rather than the impact of separate shocks. The impact of these successive up-and-down cycles is not neutral. Their impact may result from either an asymmetry of ex post reaction to positive and negative shocks or from the uncertainty generated by previous cycles. Consequently, there are both ex post and ex ante effects of instability (as Gunning 2004 clearly underlines). However, most measures used in cross-section literature rely *on* ex post concepts.

Structural sources of instability versus policy sources and growth volatility

A few empirical studies propose a test for macro vulnerability that considers the *instability of growth* but without a specific and separate examination of its main sources.

For example, Ramey and Ramey (1995) show a significant link between the instability of the rate of economic growth and the average rate of growth itself (testing exogeneity of the instability). But this instability can also be due to structural as well as policy factors, which is why the volatility of growth cannot be an approximate indicator of *structural* vulnerability (cf. infra). The same applies to the recent, systematic attempt by Hnathovska and Loayza (2004) to assess the link between output volatility and growth. Neither study examines the impact of structural vulnerability as such.

The effects of *export instability*, a main source of structural vulnerability in developing countries, have been examined over the years in the literature using growth regressions. There now seems to be a consensus emerging from several studies to conclude that export instability (or, in some studies, terms of trade instability) has a negative effect on growth.[5] More significant effects are found when the studies simultaneously test the (positive) effect of export growth and the (negative) effect of export instability and when the export instability (size of the shocks) is either weighted by the average export-to-GDP ratio for the period (Guillaumont 1994; Combes and Guillaumont 2002)—a ratio which, *ceteris paribus*, is the higher the lower the population size, or is an instability of the export-to-GDP ratio itself (Dawe 1996). Thus, the exposure to shocks is taken into account.

Primary versus intermediate instabilities

The instability of export-earnings is not the only aspect of instability that has been tested. In an earlier study, we estimate the influence of several *primary instabilities*, mainly exogenous, on the rate of growth, and argue that these instabilities, significantly higher in Sub-Saharan Africa than in other developing countries, may have been a major factor in the region's slow growth rate during the 1970s and 1980s: these instabilities are the instability of the terms of trade, weighted by the average export-to-GDP ratio, or that of the real value of exports, similarly weighted, the instability of the agricultural value added (weighted by the average share of agricultural value added in GDP) and political instability. The first and the third factors appear to have a significant effect on growth, but not that of the agricultural value added (Guillaumont et al. 1999). However, in another study, instability of both real value of exports and agricultural value added (unweighted here) appears to be significant (Guillaumont and Chauvet 2001). Recently Miguel, Satyanath, and Sergenti (2004) have found evidence of the impact of rainfall variations on growth in African countries during 1981-99 and on the subsequent likelihood of civil conflict.[6]

The effects of primary instabilities have a greater impact on the rate of change in factor productivity than on the level of investment. Primary instability is channelled through *intermediate economic instabilities* (Guillaumont, Guillaumont Jeanneney, and Brun 1999), namely, instability of the rate of investment and of relative prices. These two intermediate instabilities have an adverse effect on growth and are related to policy which is weakened in this manner by structural vulnerability. First, instability of the rate

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5 See, for instance, Glezakos (1984); Gyimah-Brempong (1991); Fosu (1992, 2002); Guillaumont (1994); Lutz (1994); Dawe (1996); Mendoza (1997); Guillaumont, Guillaumont Jeanneney, and Brun (1999); Bleaney and Greenaway (2001); Combes and Guillaumont (2002); and the review of the literature by Araujo Bonjean, Combes, and Combes Motel (1999).

6 Actually the aim of their paper is to test the impact of negative growth shocks on the likelihood of civil conflict, and it only uses rainfall variations as an instrumental variable for economic growth.

of investment—curiously neglected in the literature—is a factor of lower average capital productivity. As a result of the declining marginal productivity of investment, the gain in total output from a high level of investment is smaller than the loss due to a low investment level. This is illustrated during boom periods by projects that are oversized, under-prepared and weakly productive, and mainly concerns public investment. The second intermediate instability, i.e., of the relative prices, proxied by the instability of the real effective exchange rate (REER), also appears to have a strong negative effect on the rate of growth. It is assumed to blur market signals and induce a misallocation of investment. This adverse impact of the REER instability or volatility has also been noted in several papers (Ghura and Grennes 1993; Serven 1997; Aizenman and Marion 1999; Guillaumont, Guillaumont Jeanneney, and Brun 1999).

Instability of real producer prices—whether due to macro policy resulting through REER instability or the passing through of world agricultural prices fluctuations to farmers—is generally considered to be a factor in the lower average agricultural output, noticeably through its effects on the adoption of new technique, similarly to the weather risk (Newberry and Stiglitz 1981: see UN 2001 for a review of studies on the impact of risk on agricultural productivity). The effects of real producer prices instability on agricultural production growth have also been significantly tested at the macro level in a sample pooling several products in a number of countries (Guillaumont and Combes 1996; Boussard and Gérard 1996; and Subervie 2006 for the effects of real border prices instability).

Thus it seems that external instability induces negative effects through the instability of the investment rate and in the real exchange rate, either via its impact on public finance when retained at the government level or at the producer level when price fluctuations are passed through to producers.

Instability is also channelled to growth through political instability. The primary instabilities, and the induced intermediate ones, are a factor in political instability and civil war, and through these events, also a significant factor of slower growth. The instability of exports, all the more severe when exports are primary, exacerbates feelings of frustration. When exports instability, weighted by the openness rate is introduced in a conflict occurrence model à la the Collier-Hoeffler (2004), not only does the coefficient of determination increase significantly, but also the share of primary commodities in exports becomes insignificant (Guillaumont et al. 2005). Other exogenous shocks may have similar effects on the risk of conflict. In examining the impact of civil war on growth, Miguel, Satyanatah, and Sergenti (2004) instrument civil war by rainfall instability, which then appears to be a significant factor of it.

2.1 The impact of shocks depends on exposure

Country size exerts major influence

The main structural factor in greater exposure to exogenous shocks is, of course, the smallness of a country. There are several methods for measuring the size of a country, but the most meaningful is the number of inhabitants. In some cases (possibly with regard to natural shocks) smallness of area could be a more relevant measure of the exposure to shocks, but for assessing the main economic consequences of the size of a country independently from its income per capita, the most common measure is its population numbers.

The vulnerability issue is faced with both old and renewed discussion on the consequences of the size of nations.[7] Of course, the size of a country has many consequences, not all of them related at first glance to vulnerability, as for example, scale economies in many activity sectors of industry as well as government (the unit costs of public administration are expected to be higher in smaller countries). However, when investigating the channels through which size does matter for development, links with vulnerability become clearly apparent. There are at least three main channels (or intermediate variables) through which small size influences the exposure components of vulnerability: (i) trade intensity, (ii) government size, and (iii) social cohesion.

The variable *exposure to external shocks* is well-reflected by the export-to-GDP ratio. The smaller the (population) size, the higher (*ceteris paribus*) the trade-to-GDP ratio (and the more 'dependent' the economy). Country size is the main structural factor determining the trade-to-GDP ratio. Thus it is the main determinant of 'natural openness' and the main factor to be neutralized if an index of 'openness policy' is to be drawn from the observed ratios (Guillaumont 1989, 1994). It is clear that the larger the share of exports in GDP, the greater the impact of a given export shortfall. For this reason, the impact of export instability (and of export growth as well) is estimated more accurately when the export instability variable (as well as export growth) is multiplied by the export-to-GDP ratio, i.e., when it is a 'weighted' instability.[8/9]

Moreover, the diseconomies of scale associated with smallness result in greater difficulties to diversify at low cost. As a consequence, small low-income countries face a higher risk of implementing inefficient or costly policies if they adopt protectionist measures. For the same reason, a global protectionist trend is likely to be more damaging for small countries. Alesina and Spolaore (2004) test this effect in a cross-section growth regression through a multiplicative variable of the (log of) population and openness. The coefficient of this multiplicative variable is found to be significantly negative, while the coefficient of each of the two variables added independently to the regression is significantly positive.

Smallness is also considered to be a factor of slower growth through its assumed impact on the *size of government*. The assumption of a (negative) relationship between (population) size and the relative size of government activities is successfully tested by Alesina and Spolaore (2004). A reason may be found in an earlier work, Rodrik (1998) who argues that a high trade-to-GDP ratio (often related to a small population size) leads to an extension of the role of the state in order to provide more insurance to citizenry. The relationship can also be linked to the stronger effect of public revenue instability on public consumption. If the large size of government activities is a source of higher costs, this may again be the source of vulnerability due to smallness, and thus likely to lower growth.

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7 See recent works by Alesina and Spolaore (2004) and Winters and Martins (2004).

8 While natural openness, mainly determined by smallness, increases exposure to trade shocks and consequently their negative effect on growth, openness policy is not only a positive factor of growth, but also a factor of greater resilience (Guillaumont 1994; Combes and Guillaumont 2002).

9 Let us add that with regard to natural shocks or disasters, as far as they generally concern some specific groups of the population, the larger the population, the smaller the aggregate exposure: in a large country, climatic shocks are likely to affect only a small part of the population.

A third channel through which the country (population) size may impact on vulnerability and growth is *social cohesion*. It may be an advantage of smallness to allow for greater social cohesion (less ethnic, linguistic or religion fragmentation). If social fragmentation constitutes a negative factor of growth *and* if fragmentation increases with population size, then smallness is an advantage, not a handicap. It needs to be noted that fragmentation as a handicap is not unrelated to vulnerability: it is assumed to impact negatively on growth because this structural factor influences the exposure or resilience to shocks (Rodrik 1999). Reality may be more complex, and several studies indicate non-linear relationships where linear ones are assumed. In particular social polarization, rather than social fragmentation, may be a handicap (and a factor of vulnerability) (Arcand, Guillaumont, and Guillaumont Jeanneney 2002). Furthermore, polarization does not increase with population size, but rather decreases with size (at least beyond a low threshold).[10] Also for same reason, smallness may appear to enhance, not lower, vulnerability.[11]

Nevertheless, it is clearly apparent from several cross-country regressions that when appropriate control variables are used, the (log of) population size is a significant positive factor of growth (Guillaumont and Guillaumont 1988; Guillaumont and Chauvet 2001; Bosworth and Collins 2003; Millner and Weyman-Jones 2003; Alesina and Spolaore 2004) and a negative factor of export instability (Easterly and Kraay 2000). The fact that smallness reduces growth may be due either to higher vulnerability or to scale diseconomies or to their combination.

Other factors of exposure

In addition to smallness of population size, other factors of exposure to shocks are to be considered. These are related to the structure of the economy and to the location of the country, as primary economies and remote countries are more exposed to external and natural shocks. The extent of their risk is examined below with exposure indicators. Let us note here that remoteness—as with smallness—is a structural handicap not only because it is a factor of vulnerability.[12] Indeed, distance remains an important obstacle to trade despite decreased transport costs (Brun, Guillaumont, and de Melo 1999; Brun et al. 2005; Carrère and Schiff 2005).

2.2 More on poverty effects of structural vulnerability

Instability, through its effects of deterring long term growth, has deleterious consequences on the pace of poverty reduction. It also has direct social effects independent of its influence on the average rate growth. Two factors make these direct effects likely. The first is the feeling of frustration generated by a shortfall of income after a rapid expansion that created new needs and exaggerated expectations, as illustrated above by the risk of civil war or of crime. The second is related to poverty traps, linked to the asymmetry of reactions of health, education, employment to income

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10 Even the assumption of a negative correlation between population size and other linguistic fragmentation is debatable: when fragmentation is explained by the size of both the population and area, the coefficient of population size is significantly negative, while that of area is (significantly) positive. Since the absolute values of the coefficients are similar, it means that fragmentation decreases with population density (internal work in process at CERDI).

11 The greater social cohesion of small islands is also discussed by Helleiner (1996).

12 The relevance of remoteness for vulnerability has been underlined by Encontre (1999).

fluctuations. Insofar as instability lowers growth, it not only retards poverty reduction that can normally be expected from growth, but also results in an anti-poor bias for a given average rate of growth.

First, *instability of income lowers child survival*. Perhaps the best single indicator of the evolution of the social situation in low-income countries is the rate of child mortality under five, as made available by demographic and health surveys and extended by the WHO. Child mortality is a very sensitive indicator and is likely to reflect the strong asymmetric effect that can be expected from income instability. If a rise in mortality results from an income shortfall, it will not be compensated later by an equal increase in income. Also, due to the existence of a lower limit to child mortality, the best functional form in which the dependent variable is expressed as a logit (Grigoriou 2005), implies for the relevant range of mortality values an asymmetry in the up and down effects of income variations. Tested in GMM, with observations every five years from 1980 to 2000, the effect of previous income instability on child survival appears to be significantly negative (Guillaumont 2006; Guillaumont, Korachais, and Subervie 2008).

Second, *instability of income lessens poverty reduction*. When we introduce the macro vulnerability concern highlighted in the cross-country research on the determinants of the level and evolution of poverty, made feasible by the extension of a comparable dataset at the World Bank, it appears to be a neglected factor. Our main concern until now has been to assess the growth and inequality elasticities of poverty (there's a good illustration in Adams 2004), but without a similar concern with regard to the effects of income instability on poverty reduction.[13] However, a reasonable assumption is that income instability pushes people into the poverty trap (the poor contracting health handicaps, children leaving school, workers dropping out of the labour market, …), so that the poverty reaction to a rise in average income is less than its reaction to a fall.[14] This effect is expected to lower the absolute level of the average growth elasticity of poverty, and/or to increase poverty independently of income growth and inequality change: the instability of income must then be introduced both additively and multiplicatively with income growth. Measuring poverty change through the log of the headcount index of poverty on a sample of ten-year spells and controlling for the rate of growth of income per capita and initial level of poverty, we obtain significant coefficients for the impact of income instability on poverty. This effect corresponds to an increase in inequality which is captured only partially by the change in the Gini coefficient (another control variable).[15] It must be remembered that in addition to this direct impact, growth volatility lowers the average rate of growth. Indeed, stability is good for growth, which is 'good for the poor', but it also makes growth better for the poor. Stability of growth makes it pro-poor (Guillaumont 2006, Guillaumont and Korachais 2008).

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13 The effects of financial instability on poverty, however, are examined by Guillaumont Jeanneney and Kpodar (2005).

14 See, for instance, de Janvry and Sadoulet (2000) in the context of Latin America.

15 Consistent with the idea that instability increases inequality, as found by Breen and Garcìa-Peñalosa (2005).

3 Designing a structural economic vulnerability index, with particular reference to the UN-CDP index

In this section we consider three issues:

- structure of the present EVI;
- sensitivity to methodological choices; and
- some levels and trends, using a 'retrospective EVI' for the latter.

3.1 Structure of the present EVI

The economic vulnerability index (EVI) is the composite index set up by the CDP and applied a first time in 2000 as a criterion for identifying the least developed countries. Incorporating minor amendments EVI was applied in 2003 and again, with major revisions, in 2006 (UN 2000, 2003, 2006). Amendments and revisions were agreed upon one year before these two last (2003 and 2006) triennial reviews of the LDCs list (see UN 2005, and the recommendations given in Guillaumont 2004a, 2004b, 2006). The present EVI is a composite index calculated from seven component indices, made up of four shock indices and three exposure indices. Using an arithmetic averaging, equal weight is given to the sum of the shock indices and the sum of the exposure indices. In the shock indices, equal weight is given to natural and external shocks, while in the exposure indices equal weight is given to population size and to the total of other indices. Naturally, there are several other ways, some possibly more logical, how these component indices can be weighted and averaged (Guillaumont 2006, 2008b), but the method adopted in EVI by the CDP has been chosen for reasons of simplicity and transparency.

Here we consider a composite index[16] rather than a single one, such as the *growth volatility*, commonly used in econometric works. The volatility or instability of the rate of growth of income (per capita) reflects ex post macro economic instability which depends on exogenous shocks and structural factors of exposure, but also on policy factors, either as a reaction to shocks or as autonomous policy shocks. There is clear empirical evidence of the influence of policy factors on growth volatility (Easterly, Islam, and Stiglitz 2001; Combes et al. 2000).[17] Hence, growth rate volatility cannot be considered to constitute a good synthetic indicator of structural vulnerability. Moreover if costly insurance or compensatory mechanisms are at work, the negative impact of shocks on growth does not necessarily involve growth instability.

In the design of the EVI, the components have been retained as they reflect the main channels through which structural vulnerability affects growth potential.

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16 There are several earlier attempts in the literature to propose a composite indicator of economic vulnerability, Briguglio (1995); Atkins, Mazzi, and Ramlogan (1998); Crowards (1999); UN (1999); Guillaumont (2008b), for instance, but not all corresponding to our concept of structural vulnerability.

17 For instance, Easterly, Islam, and Stiglitz stress the negative effect (up to a point) of financial depth and the positive effect of openness on volatility. More specifically, with regard to the effects of openness, Combes et al. (2000) find that structural vulnerability (depending on structural factors, including population size) makes growth more unstable, whereas outward-looking policy has the opposite effect. Bleaney and Fielding (2002) also examine the impact of the exchange rate regime on output volatility in addition to the impact of exogenous factors such as instability in the terms of trade.

Natural and trade shocks

Climatic and other natural shocks are a main source of vulnerability in many developing countries and these cover a large variety of disasters: earthquakes, typhoons or hurricanes, floods, droughts, insect invasions, etc. An indicator of the risk of natural catastrophes might be the frequency of such events, measured over a long period of time. But as evidenced by the recent Asian tsunami, the most severe and exceptional disaster does not correspond to any measurable probability. The potential negative impact of these very different catastrophes differs from one to the next, and/or even within the same type of disaster. Measuring the resulting economic losses in all the developing countries concerned seems an impossible task. A better approach would be to take the number of people affected, if known, but even then different people may be affected with varying severity. Indicators of the average proportion of the population affected can be used specifically with regard to the way the population is affected (killed, displaced, …).[18] The *percentage of population displaced due to natural disasters (homeless index)* has been included as a component of EVI since 2003 when comparable data became available.

Due to this data problem and to the fact that not all natural shocks (as for instance recurrent droughts in Sahelian countries) are registered as 'disasters', another proxy was needed. The answer was the *instability of agricultural production*, measured with regard to its trend value. Whereas the trend of agricultural production can be assumed to depend mainly on a country's economic policy and certain other permanent factors, fluctuations around the trend can be hypothesized to be a reflection of the occurrence and severity of natural shocks, because these are likely to affect agricultural production.[19] This is why this indicator was retained as a component of the EVI.

The earlier two measures of natural shocks, which are not correlated, are only complementary proxies of the size of the natural shocks that are likely to affect growth prospects (likely to be aggregated by a single average in a natural shocks index). They give an indication of the average size of *past* shocks which is only a proxy of the risk of similar shocks in the future. The risk of extreme or exceptional natural shocks, such as the December 2004 Asian tsunami, cannot be captured ex ante by any index of the likelihood of shock. In the measures presented here, extreme conditions can only be reflected ex post, and more as a lasting damage, i.e., a structural handicap, than as a risk. This difficulty calls for more attention to be given to exposure indices.

Another caveat is needed. Instability indices are related to a trend or to an average level. Trends, even if to some extent predictable, can also reflect a structural handicap (e.g., declining rainfall levels or rising sea levels). But they are not presently included as a component of EVI.

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18 The main source of the data is the Emergency Events Database, compiled by the Center for Research on Epidemiology of Disaster (CRED) at the School of Public Health, Université Catholique de Louvain, data also given and supplemented in the IRC annual *World Disasters Report*. Based on these data sources, a picture of natural disasters in each of the LDCs can be found in UNDP (2001). A previous use of these data for the measurement of vulnerability is in Atkins, Mazzi, and Ramlogan (1998).

19 We use this indicator in several earlier studies (cf. for instance, Guillaumont and Guillaumont 1988; Guillaumont, Guillaumont-Jeanneney, and Brun 1999).

The *trade shocks* indicator is represented by the instability in real export proceeds surrounding the trend. It needs to be applied to total exports of goods and services, as shocks affect both types of exports, and service exports in small (developing) countries often account for a large part of total receipts. Some private transfers, such as migrant remittances, could also be included. It is assumed that for small countries this instability is structural, resulting from exogenous events such as fluctuations in world prices, in external demand and in domestic events that are not related to policy (e.g., climatic shocks). Of course, some export volume fluctuation with regard to its trend may be due to instability of policy itself, but it can be hypothesized that policy has greater influence on the trend than the fluctuations of the export volume.[20] However, the trend in the terms of trade, to a large extent, seems to be beyond the control of the country. When the terms of trade deteriorate (as when the sea level rises), it may be a handicap, but does not necessarily constitute (unexpected) shock. Furthermore, terms-of-trade trends may be reversible, whereas the trend in sea levels is hardly so.

Equal weight is given to the trade shock index and to the natural shock index when they are averaged in the shock index.

Exposure to shocks indicators

Exposure indices are of particular importance for two reasons. First, the impact of shocks is the stronger the greater the exposure of the countries. And second, shocks indicators rely on the frequency of past events. These are taken as a probability of similar future events, but do not reflect the risk of being affected by exceptional future events, a risk which depends on exposure and which can therefore be captured through exposure indices. Four indicators are used for the measurement of exposure to shocks.[21]

i) The first one is an index of the population size (in logs), considering that small size is a handicap due to vulnerability and other factors, as explained above.

ii) The export concentration coefficient, as calculated by UNCTAD for a long time and frequently applied in academic literature, has been used since the first definition of EVI, but has been limited to the exports of goods (not services).

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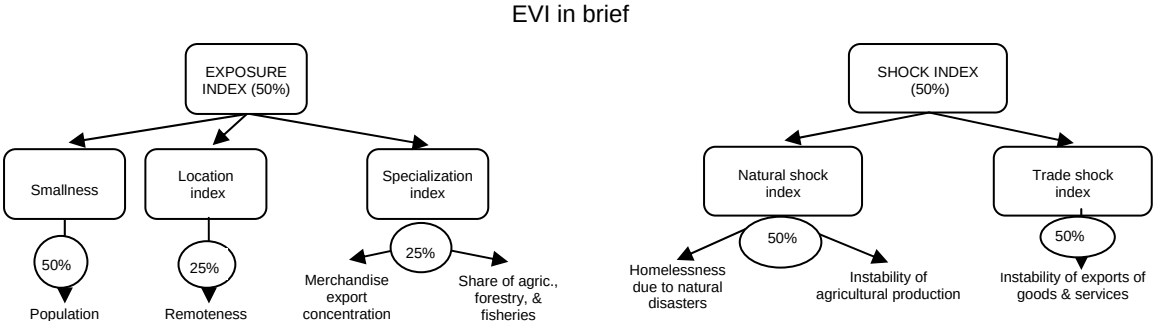
20 The use of instability indices as components of a vulnerability indicator raises measurement problems. Instability is always relative to a reference or trend value. It is measured, for instance, by the average absolute deviation from the reference or trend value, or more commonly, by the variance of this deviation. A critical issue is then the choice of this reference value, in particular the estimation of the trend. A deterministic trend has long been adopted, for instance, in the export-instability literature. This was often inappropriate due to the possibility of non-stationarity of the series. On the other hand, the series may not be purely stochastic, and the reference value can be conveniently estimated from a 'mixed' function, combining a deterministic element and a stochastic element: this is how instabilities of exports and of agricultural production have been estimated in the EVI and which we retain in the next simulations. Several other measures are used in the empirical literature on issues that concern us. For instance, measurements of growth volatility generally use the standard deviation of the rate of growth (which may not be appropriate when the rate of growth is not stationary). Other works on volatility use empirical filters such as the Hodrick-Prescott filter, in which a series is divided into 'cycle' and 'trend' components. When we compare the instabilities with regard to a trend measured from a mixed trend over 12 years similarly as is done for the CDP, and to an Hodrick-Prescott trend, the correlations obtained between the two series of instability are very high (either level or rank correlations) (CERDI calculations).

21 An extended discussion of the appropriate components of the exposure index is presented in Guillaumont (2008).

iii) The share of agriculture, forestry, fisheries, instead of the (complement to 100 of) share of manufacturing and modern services, has been considered since 2003 as a better reflection of the exposure to trade and natural shocks.

iv) An index of remoteness from world markets (adjusted for landlockedness), designed and calculated at CERDI, has been utilized by the CDP in the measurement of EVI. It measures the minimum (weighted) average distance for a country to reach a significant part (50 per cent) of the world market.

With regard to each of these indicators, the LDCs appear, on average, to be more vulnerable than other developing countries.



3.2 Methodological choices to aggregate the components: weighting and averaging issues

The component indicators of EVI have been weighted and arithmetically averaged in a simple and transparent, although somewhat arbitrary manner. Next, we examine whether alternative methods could be considered.

Arbitrary or revealed weights: vulnerability measured as the expected loss of growth?

The simplest and most transparent way to aggregate is to calculate, after measuring each component on a same scale based on maximum and minimum values, an unweighted average of these components (as is commonly done for some popular indices such as the HDI). There is indeed an arbitrariness apparent in this method since the actual weight is given by the number of components, and then results from the choice of the components themselves. It seems reasonable to give equal weight to both the shock and exposure components so that the vulnerability index is an average of the exposure index (EXP) and the shock index (SH) with equal weight given to trade shocks (TS) and natural shocks (NS). As for the exposure index, since the main factor of exposure is the (small) size of the population (SP), it has been given a half weight, with the other half (RS) being shared between the location component (remoteness) and the economic structure or specialization component (share of agriculture and export concentration).

To avoid the arbitrariness of equal weighting, some measures of vulnerability weigh the components by their estimated impact on the rate of growth or its instability. For instance, Guillaumont and Chauvet (2001) use a set of component indicators to build a composite indicator of vulnerability, in which the weights are not chosen a priori, but

are drawn from an econometric regression so that they reflect the estimated impact on economic growth of the different components indicators (which is consistent with the definition of vulnerability as a handicap to growth). The resulting vulnerability indicator can be seen as the *ceteris paribus* impact of the exogenous shocks and exposure variables on economic growth. It is the estimated loss of growth due to structural vulnerability.[22] However, it has to be recognized that this method of measurement of structural vulnerability, dependent on the quality of the regressions, seems more appropriate for academic use than for international policy. Moreover specific problems arise for aggregate vulnerability indicators that need to be addressed in any case.

Reflecting the interaction between shocks and exposure

Let us consider the index of economic vulnerability as relying on four elements: shock index composed of a trade shock index and a natural shock index, and exposure index composed of indices for (low) size and 'location and structure'. Several averaging methods may be used to combine shocks and exposure indices. In the (traditional) arithmetic averaging of the (four) elements, each index is taken independently from the others. If we want to take into account the fact that structural vulnerability is the result of the interaction of shocks and exposure, we may need to consider other methods of averaging.

One method could be a *semi-geometric averaging*. This combines a geometric averaging of the two composite shock and exposure indices and an arithmetic averaging of the respective components of these two indices: the exogenous shocks indices, because these shocks are substitutes, are arithmetically averaged in the index of shocks, and an index of the exposure to shocks is similarly measured as an arithmetic average of the corresponding components, but the two respective indices of shocks and of exposure to the shocks are geometrically averaged, because shocks and exposure have multiplicative effects. The more a country is exposed to shocks, the greater effect they have on its vulnerability, and the greater the importance of the shocks, exposure makes a country all the more vulnerable. But this method should be specified with regard to another consideration or principle.

Reflecting the increasing marginal impact of vulnerability components

Rather than calculate the geometric average of the shock and exposure indices (EXP and SK) as:

$$EVI = \sqrt{EXP \cdot SK}$$

[22] Another example of econometric weighting is given by the Commonwealth Secretariat index of vulnerability (Atkins, Mazzi, and Ramlogan 1998; Easter 1999). It is an estimated value of instability of the rate of growth, with three explanatory variables empirically chosen among more than fifty variables, reflecting policy factors as well as structural factors. One main problem with this indicator is that it measures vulnerability with regard to growth volatility which, as noted above, is not a good synthetic indicator of structural vulnerability since it depends on policy factors as well as structural ones. An alternative method would be to consider a 'natural growth volatility' estimated from a regression including only structural factors, not depending on policy, as the components of EVI are assumed to be. But such a measure would not be preferable to the estimation of the impact on growth of the structural vulnerability components: structural vulnerability has been designed with reference to growth, and would be better measured by a loss of growth than by an excess volatility.

it is preferable to consider giving more emphasis to the impact from the two shock and exposure indices which is greater, and to calculate:

$$EVI = 1 - \sqrt{(1 - EXP)(1 - SK)}.$$

The EVI is then drawn from a multiplicative index of low vulnerability. The relevance of this measurement can be illustrated by tsunami: in as far as the likelihood of shocks is not easy to assess, it is all the more important to consider very exposed countries as vulnerable, even if the past frequency of shocks has been low.[23]

Another type of averaging, an intermediate one but convenient, is to take an arithmetic average of the indices of log values of each of the two shock and the two exposure indices after transforming them in indices of low vulnerability. This allows one to capture the various interactions between these elements in determining vulnerability (each component being first measured as a low vulnerability indicator, transformed in log, then taken as one less the index of this log value, so as to reflect a likely increasing marginal impact of the vulnerability factors). This arithmetic average of the complements to one of the log indices of the main vulnerability components can be written (with l': index of the log of):

EVI(al) = ¼ [(1-I'P)+(1- I'(1-RS)+(1-l'(1-NS)+(1-l'(1-TS))]

The resulting EVI can be decomposed into each of the four indices (and their subgrouping in shocks and exposure indices).

Sensitivity of results

Naturally, major deviations in the level of EVI can be expected from changes in the choice of components and weights given to each. Significant differences can be observed between the EVI measured in 2006 and that what would have been obtained with the composition and weights of the 2003 EVI (average of the absolute difference of ranks among 65 LDCs and other low-income countries (LICs) nearly equalling to 7). It is the anticipated result of the improvements introduced in the meanwhile.

It is more interesting to look at the consequences of the averaging methods. Table 2 gives a simulation of EVI 2006, applying several averaging methods; comparisons are made through the differences in ranks among a set of 65 LDCs and other LICs, and the average of the absolute values of these differences. Greater deviation from the arithmetic average used in 2006 is obtained with the arithmetic average of log indices than with the semi-geometric average, because trade and natural shocks, which are separated in the former only (but gathered by a simple arithmetic average in the latter), are uncorrelated. The higher the number of components, the larger the difference.

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[23] It would indeed be conceivable to weigh the respective shock indicators by corresponding exposure indicators. In other words, each indicator of the size of the shocks could be weighted by an indicator of the exposure assumed to correspond to the shocks, and the aggregate index of vulnerability could be decomposed in vulnerability sub-indices related to each kind of shock. But there is no simple correspondence between shock and exposure indicators, for instance small-sized economies appear to be more exposed to natural shocks, not only to trade shocks (Maldives). Thus it seems easier and more relevant to weigh the average shock index by the average exposure index.

3.3 Comparing synthetic indices, levels, and trends

We briefly compare the synthetic indices from two datasets: (i) official dataset applied by the CDP at the 2006 review of the list of LDCs, and (ii) the tentative dataset of a 'retrospective EVI', as calculated by CERDI/FERDI in collaboration with UN-DESA over a 30-year period starting from 1970 and defined according to the 2006 EVI definition.[24] It indicates no decrease, on average, in LDCs, although a decrease is evident elsewhere. Two detailed tables (Tables 3 and 4) related to the levels and trends of the country groups are given at the end of the paper.[25]

The results between the two datasets do not differ significantly and this allows us to draw a few observations:

- EVI is higher in the LDCs and in the SIDS than in other developing countries;
- the gap between LDCs and non-LDCs is increasing, while the gap between SIDS and non-IDS is decreasing;
- EVI is still higher in the SIDS than in the LDCs, but diminishing;
- while the exposure index is significantly higher in the SIDS than in the LDCs, the shock index is higher in the LDCs;
- the diminishing gap between the LDCs and the SIDS is due to the shock index, as the gap between the average exposure indices has not changed (see Appendix Table);
- the slightly higher level of EVI in the low-income countries compared to middle-income ones is due to a somewhat higher shock index, while the exposure index is lower.

In brief, EVI on average is not only higher in the LDCs than in any other group of countries (except SIDS), but also does not appear to have declined, as in other groups (SIDS included).

Averages from the 2006 review of the LDCs list, and from a retrospective database

	Shock index	Exposure index	EVI
	Averages from the 2006 review of LDC list		
LDCs	52	55	53
Other LICs	37	37	37
All LICs	47	44	46
All MICs	37	47	43
Landlocked countries	44	51	47
SIDS	45	67	56

24 This dataset will be available soon from the UN-DESA website.

25 To test the significance of the difference we use the non-parametric test of Wilcoxon. Whereas comparison of LDCs, as well of SIDS, to other developing countries is unambiguous, comparisons between LDCs and SIDS raise a specific problem due to the fact that the two categories are partly overlapping. For that reason, the significance of the differences are tested by only comparing the LDCs non SIDS and the SIDS non LDCs. We also consider how the overlapping group of LDCS-SIDS compare to the LDCs non SIDS and to the SIDS non LDCs. More.detailed comparison between LDCs and SIDS can be found in Guillaumont (2007a).

Averages from the 2006 review of the LDCs list, and from a retrospective database

	Averages from a retrospective database				
	EVI			Shock index	Exposure index
	1970-79	1980-89	1990-99	1990-99	
LDCs	53	52	51	49	54
Non-LDCs	43	39	38	35	3§
SIDS	59	56	54	44	64
Non-SIDS	43	40	40	39	40

4 Using EVI for international development policy

Here we consider two main policy implications of the availability of the EVI. The more direct implication is related to the identification of the LDCs, the purpose for which the index has been created. The second issue, more indirect and general, is related to the use of EVI as an instrument in the design of aid policies.

4.1 EVI as a criterion for identifying LDCs: the graduation issue[26]

As noted in the introduction, EVI is one of the three criteria used by the Committee for Development Planning for the identification of the LDCs: GNI per capita and the human assets index (HAI), a composite index of health and education indicators, are the two other criteria. For inclusion in the list, a country must meet the three complementary criteria: be a low-income country, with a low level of human capital, and high vulnerability. The complementarity between the three criteria is consistent with the assumption of a combined effect of vulnerability and human capital on growth. The LDCs are low-income countries, suffering from structural handicaps, and assumed to exhibit *both* a low HAI and a high EVI (the three criteria complementary for inclusion). It implies that a high EVI, in association with a low HAI, is used to identify the risk of a poverty trap. Since 2000, the EVI approach has led to a few new inclusions: Senegal was the only country to have been included in 2000 as a result of EVI, and Papua New Guinea was to become eligible in 2006, its inclusion pending on its acceptance.

The possibility of exit or graduation from the list, and related rules were introduced only in 1991. These rules have been carefully designed to avoid premature departure from or movement in the list, such as countries, after exit, becoming again eligible for inclusion. Margins were imposed for the inclusion and graduation thresholds of the criteria. Exit eligibility is to be confirmed at two successive triennial reviews. And, more important, to be eligible for graduation, an LDC must show improvement in two of the benchmarks. Briefly stated, implementation of the criteria is asymmetric for inclusion and graduation.

Since in 1991, only one country—Botswana—has graduated (1994). The graduation of Cape Verde and Maldives was ratified by the UN General Assembly in 2004 for implementation later. Samoa has been recommended by the CDP for graduation in 2006. Kiribati, Tuvalu, and Vanuatu were given the first-round eligibility clearance by

26 These issues are examined in greater depth in Guillaumont (2008b).

CDP in 2006, but this needs to be reconfirmed at the 2009 review before any recommendation is made.

It has to be noted that the LDCs mentioned above as possible graduates are SIDS. They have resisted the recommendation, and resistance by the Maldives was particularly strong, as is now from Samoa, based on the argument that these countries are highly vulnerable, as is evidenced by their EVI levels. Following this argument, some potential graduate countries have requested that an LDC could not be made to exit the list until it is no longer (highly) vulnerable, implying that (low) EVI would become a 'compulsory' criterion.

If certain developing countries have been able to sustainably achieve a significant rate of growth as well as high levels of human capital, they are not likely to be locked in a poverty trap, as LDCs are generally assumed to be. And, the high level of their human capital, reflected in the fact that they can meet the corresponding (HAI) criterion for graduation, is perhaps the reason.

The vulnerability of these countries, however, remains a matter of concern. This is why a smooth transition strategy for graduating countries has been proposed by the CDP and officially adopted by the UN General Assembly. Economic vulnerability should also be considered, through EVI, as a relevant parameter of aid policies.

4.2 EVI as a criterion for aid allocation

Reviewing some results about aid effectiveness

Although a negative factor of growth, structural vulnerability is sometimes only captured by (exogeneous) export instability, and has been found to increase marginal aid effectiveness (the marginal contribution of aid to growth) more significantly than the quality of institutions and policy, so strongly put forward by Burnside and Dollar (2000) and the World Bank (1998). In other words, aid dampens the negative effects of vulnerability on growth (Guillaumont and Chauvet 2001; Chauvet and Guillaumont 2004, 2008). These growth-regression results are supported by the micro-macro analysis of the determinants of the rate of success of World Bank projects (Guillaumont and Laajaj 2006). It follows that aid is potentially more effective in vulnerable countries such as SIDS and LDC. To be noted, either pro-cyclical or contra-cyclical aid may have a stabilizing impact with regard to exports, which we measure as the difference between export instability and aid plus export instability. This stabilizing impact is a significant factor of growth, confirming our previous results (Chauvet and Guillaumont 2008). Moreover, aid, through its stabilizing impact, has a double effect on poverty reduction. First it enhances growth, which is a major factor in poverty reduction, and second, by making growth more stable which also makes it more pro-poor (Guillaumont 2006). These findings, briefly recalled, have implications for aid policies, and EVI may be helpful in drawing such implications.

Structural vulnerability included among the criteria for aid allocation[27]

A possible easier way to take economic vulnerability into account in the design of aid policies is to consider it as a relevant criterion of aid selectivity. The usual criteria of aid selectivity are the level of poverty (income per capita) and the quality of governance (based on the World bank's CPIA or any other index, such as ICRG or the Kaufman and Kraay index) (see for instance Collier and Dollar 2001, 2002; World Bank 2004, 2005). However, they do not include vulnerability, which could easily be done with EVI.

There are at least two reasons to support this. First, as seen above, aid effectiveness is increased by structural vulnerability: aid will be more effective if allocated according to vulnerability (among other criteria). It is an empirically grounded argument that is as solid as the similar argument used to retain governance as a criterion. The second reason is one of justice or equity: if we acknowledge that the goal of aid is to compensate for structural handicaps to growth in order to promote an equality of opportunities/chances, this is again a legitimate rational for retaining structural vulnerability as an aid-allocation criterion.

Finally, a practical matter has to be kept in mind. Retaining vulnerability, possibly EVI, as an ex ante aid allocation criterion would lead to an immediate dampening of unforeseen shocks, which is not as easy to achieve with other (albeit useful) schemes that try to trigger *aid as an insurance*.[28] The challenge is to compensate negative shocks quickly, while promoting good governance and avoiding moral hazard.[29] Here again, for the implementation of such schemes, priority could be given to the developing

Summary impact of changing the measurement of aid selectivity
average absolute value of rank differences for 42 multilateral and bilateral donors
and for 22 bilateral donors, 2003

	All 43 donors	Bilateral donors only
Between Dollar-Levin (2004) indices and other elasticity based estimates, including :		
Income pc and other governance index (KKI)	8.7	3.8
Income pc and vulnerability (EVI)	13.5	7.63
Income pc and MDGs (HAI)	11.8	6.09
All the five criteria ('global model)	12.8	7.27
Between an index based on global allocation model estimates and recipient average profile index	7.25	3.63

Source: Amprou, Guillaumont, and Guillaumont Jeanneney (2007).

27 More details can be found in Amprou, Guillaumont, and Guillaumont Jeanneney (2007) and in Guillaumont and Guillaumont Jeanneney (2006).

28 These views are extensively discussed in other papers (Collier et al. 1999; Guillaumont and Guillaumont Jeanneney 2003; Sarris 2003; Gilbert and Tabova 2005; Guillaumont 2006; Guillaumont et al. 2007).

29 The answer is to offer automatic compensation when management rules (particularly in the case of positive shocks) are ex ante agreed and implemented. It could be obtained through a regulation of debt service (+/–) according to the evolution of the terms of trade, or through a special fund for little indebted countries. Links between the micro and macro variables have to be checked, to make the insurance scheme effective not only at the macrolevel, but also for the groups more severely affected by the shocks, such as small farmers.

countries recognized as highly vulnerable with respect to EVI. In any case, effective implementation of compensation schemes is more difficult than the inclusion of EVI as an aid allocation criterion.

Such an inclusion would lead to significant changes in aid allocation for the benefit of the more vulnerable countries, LDCs as well as the SIDS. And it would change radically the assessment of donor aid selectivity, as is recently evidenced elsewhere (Amprou, Guillaumont, and Guillaumont Jeanneney 2007: table 4). We have compared the rank of donors, bilateral as well as multilateral, on their aid selectivity, measured either from aid elasticities to the indicators corresponding to agreed criteria, as is done by Dollar and Levin, or by what we call the 'average profile of receivers', according to which the profile is the average of the level of these indicators, weighted by the share of aid allocated to each of them. Summary results are given above.

Structural vulnerability versus state fragility in aid allocation: EVI versus CPIA

The concern about fragile states, the focus of the UNU-WIDER development conference on Fragile States—Fragile Groups, may enhance our argument for introducing structural vulnerability (measured possibly by EVI) as a relevant criterion for aid allocation and for helping to solve the current paradox.[30] According to the traditional paradigm, aid, on one hand, is not effective in countries with poor policies and institutions (generally measured by CPIA), while, on the other hand, the growing consensus is that some aid has to be provided to fragile states (often still identified by CPIA) to avoid these from becoming even more fragile. The so-called 'orphean states' are the children of the traditional paradigm.[31] It is not surprising that the results of regressions on aid effectiveness in fragile states are mixed or complex (see Chauvet and Collier 2005; McGillivray and Feeny 2007). Structural vulnerability, as we argue, makes aid more effective, but is also a factor of state fragility which, when measured by a policy indicator such as CPIA, is expected to make aid less effective. In a previous paper (Chauvet and Guillaumont 2004) we find that, while aid effectiveness is increased by structural vulnerability, it is decreased by political instability (a form of state fragility). It is also decreased with the quality of previous policy (suggesting a possible improvement from a low level or fragile state when aid is appropriately delivered). When state fragility results from structural vulnerability, aid dampens its negative effect, but when this is not the case, it is likely to have the opposite effect.

Nevertheless, there is a need to investigate the relationships between structural vulnerability and state fragility, as well as their implications for aid allocation. It could be argued that structural vulnerability (through EVI) should be a criterion for aid allocation, while state fragility, or any policy or institutional indicator, should be considered in determining the appropriate modalities of aid, and not only as (even less than) an aid allocation criterion (Guillaumont and Guillaumont Jeanneney 2006).

30 This point is developed in Guillaumont (2008a).

31 Indeed, for the year 2005 and 57 IDA eligible countries for which CPIA data are available, the level of CPIA appears significantly and negatively correlated to that of EVI (as measured for the 2006 review), once the level of income per capita is controlled for.

5 Conclusion: two complementary uses of EVI

Structural economic vulnerability is a matter of concern, particularly for small states (SIDS) and the least developed countries (LDCs), although differently for each group. It can be conveniently captured by the economic vulnerability index (EVI) designed at the UN by the Committee for Development Policy. This index is an instrument needed for international development policies in two complementary fields.

The first is the identification of the LDCs, which are low-income countries suffering the most from structural handicaps to growth. Economic vulnerability, as reflected by EVI, is one of the two main structural handicaps to be considered, in conjunction with the second, i.e., a low level of human capital (as measured by HAI). For inclusion in the list of LDCs, countries, when meeting the vulnerability criterion, should also exhibit low income per capita and a low level of human capital. Consequently, once a country reaches a per capita income level well above the low-income threshold and has a relatively high level of human capital, although still vulnerable, it is likely to be graduated from the list.

And second, EVI is needed in the geographical allocation of aid. For effectiveness and equity reasons, structural vulnerability (EVI) should be considered as one of the main relevant criteria of aid allocation; its use would favour vulnerable countries, LDCs as well as SIDS, and would possibly legitimate aid to some fragile states.

Two reasons may be given to underline the complementarity of these two uses of EVI. First, using EVI as an aid allocation criterion would facilitate both reaching the specific target of official development aid to LDCs (0.15 per cent) and lead to modulate aid among them. Second, it would allow graduated, albeit still vulnerable, former LDCs (generally SIDS) to benefit from certain preference in aid allocation.

Through these two uses as well as through possible other applications (such as trade policy), EVI, with possible improvements, could ensure that structural vulnerability is taken into account effectively.

Acronyms

CDP	Committee for Development Planning (of the United Nations)
CERDI	centre d'études et recherches sur le développement international
CPIA	country policy and institutional assessment
EVI	economic vulnerability index
HAI	human assets index
LDCs	least developed countries
HDI	human development index
LICs	low-income countries
LICUS	low-income countries under stress
REER	real effective exchange rate
SIDS	small island developing states
UN-DESA	Department of Economic and Social Affairs (of the United Nations)
UN	United Nations

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Tables

Table 1 - EVI level for 65 Least Developed Countries (LDCs) and other low income countries, as calculated for the 2006 review of the list of LDCs, with the measure of each component

			(1)		(2)		(3)		(4)		(5) = 1/2 (3+4)				(6)			(7)	(8) = 0.5 (6+7)		(9)		(10)= 0.5((1)+ 0.5(2+5))	(11)= 0.5 (8+9)	0.5 (10+11)
		EVI, 2006 review	Population, 2005		Remoteness		Export concentration 2003 or latest year (Main source: UNCTAD)		shares of agriculture, etc. 2003 or 2004		Specialisation index		% homeless 1990-2004				Agricultural instability 1979-2004		Natural shock index		Export instability 1979-2004 Trade shock		exposure index	shock index	EVI
			values	Max-min	Indice	Max-min	values	Max-min	values	Max-min			values		logs	Max-min	values	Max-min			values	Max-min			
LI	L	Afghanistan	29 863 010	18,59	0,766	83,30	0,318	a 25,65	38,0	63,33	44,49		0,51		-0,67	60,83	15,36	74,91	67,87		32,10	90,95	41,24	79,41	60,33
LI	L	Angola	15 941 390	28,24	0,679	72,36	0,911	95,42	15,5	25,78	60,60		0,21		-1,58	51,11	4,68	17,16	34,14		17,37	44,91	47,36	39,52	43,44
LI	L	Bangladesh	141 822 300	0,00	0,587	60,82	0,298	23,32	19,8	33,05	28,19		2,88		1,06	79,22	3,47	10,67	44,95		7,38	13,68	22,25	29,31	25,78
LI	L	Benin	8 438 853	38,02	0,579	59,84	0,456	41,92	35,0	58,35	50,13		0,91		-0,09	66,99	6,48	26,92	46,95		24,71	67,83	46,50	57,39	51,95
LI	L	Bhutan	2 162 546	58,96	0,768	83,50	0,415	37,01	33,2	55,38	46,20		0,06		-2,89	37,16	6,32	26,05	31,60		12,95	31,09	61,91	31,35	46,63
LI	L	Burkina Faso	13 227 840	31,11	0,736	79,54	0,602	59,06	33,8	56,37	57,71		0,12		-2,09	45,73	7,76	33,86	39,80		18,10	47,20	49,87	43,50	46,68
LI	L	Burundi	7 547 515	39,74	0,864	95,54	0,650	64,67	49,0	81,67	73,17		0,42		-0,87	58,64	5,64	22,37	40,51		26,97	74,91	62,05	57,71	59,88
LI	L	Cambodia	14 071 010	30,16	0,636	67,03	0,405	a 35,87	34,0	56,71	46,29		2,39		0,87	77,23	8,01	35,19	56,21		24,20	66,24	43,41	61,22	52,32
LI		Cameroon	16 321 860	27,88	0,598	62,31	0,448	40,99	23,1	38,47	39,73		0,02		-3,74	28,14	3,53	10,97	19,55		13,84	33,86	39,45	26,71	33,08
	L	Cape Verde	506 807	81,28	0,580	59,96	0,482	44,98	6,2	10,33	27,65		1,19		0,17	69,79	15,96	78,16	73,97		13,44	32,62	62,54	53,30	57,92
LI	L	Central African Republic	4 037 747	49,36	0,802	87,71	0,491	45,94	59,3	98,91	72,43		1,55		0,44	72,59	3,89	12,91	42,75		12,92	31,01	64,71	36,88	50,80
LI	L	Chad	9 748 931	35,80	0,671	71,33	0,630	a 62,37	29,9	49,84	56,11		1,16		0,14	69,48	7,81	34,11	51,80		40,32	100,00	49,76	75,90	62,83
LI	L	Comoros	797 902	74,30	0,727	78,36	0,881	91,88	40,9	68,11	80,00		0,08		-2,55	40,76	2,87	7,39	24,08		27,59	76,84	76,74	50,46	63,60
LI		Congo,Rep of	3 998 904	49,51	0,658	69,81	0,853	88,61	6,3	10,46	49,53		1,60		0,47	72,97	2,32	4,45	38,71		19,17	50,52	54,59	44,61	49,60
LI		Côte d'Ivoire	18 153 870	26,24	0,603	62,91	0,389	33,99	25,9	43,17	38,58		0,114	c	-2,17	44,87	4,28	15,04	29,95		11,68	27,13	38,49	28,54	33,52
LI		Dem. Peo's Rep.Korea	22 487 660	22,95	0,602	62,74	0,251	a 17,77	29,9	49,87	33,82		4,35		1,47	83,58	8,15	35,94	59,76		12,53	29,77	35,61	44,77	40,19
LI	L	Dem. Rep. of the Congo	57 548 740	8,50	0,658	69,77	0,555	a 53,58	51,9	86,57	70,08		0,35		-1,04	56,89	3,72	12,00	34,44		21,44	57,62	39,21	46,03	42,62
	L	Djibouti	793 078	74,39	0,618	64,75	0,584	56,91	3,1	5,15	31,03		3,33		1,20	80,73	8,81	39,52	60,12		21,64	58,25	61,14	59,19	60,16
LI	L	Equatorial Guinea	503 519	81,38	0,602	62,74	0,888	a 92,67	34,7	57,90	75,29		2,156	d	0,77	76,11	6,78	28,52	52,31		28,64	80,13	75,20	66,22	70,71
LI	L	Eritrea	4 401 357	48,03	0,618	64,70	0,589	57,51	13,6	22,74	40,12		0,49		-0,72	60,27	18,76	93,29	76,78		28,19	78,72	50,22	77,75	63,99
LI	L	Ethiopia	77 430 700	3,93	0,618	64,70	0,411	36,62	43,0	71,63	54,13		0,20		-1,59	51,07	14,28	69,06	60,06		13,84	33,89	31,67	46,97	39,32
LI	L	Gambia	1 517 079	64,41	0,561	57,60	0,459	42,28	26,4	43,98	43,13		0,42		-0,87	58,68	18,42	91,47	75,08		13,51	32,85	57,39	53,96	55,68
LI		Ghana	22 112 810	23,21	0,597	62,17	0,390	34,08	36,1	60,19	47,14		1,30		0,27	70,77	7,66	33,30	52,04		14,56	36,12	38,93	44,08	41,50
LI	L	Guinea	9 402 098	36,36	0,587	60,85	0,547	52,55	21,6	36,06	44,31		0,302	d	-1,20	55,21	3,48	10,72	32,97		8,25	16,41	44,47	24,69	34,58
LI	L	Guinea-Bissau	1 586 344	63,73	0,572	58,99	0,877	91,40	67,8	100,00	95,70		0,10		-2,27	43,79	4,26	14,92	29,35		33,18	94,30	70,54	61,83	66,18
LI	L	Haiti	8 527 777	37,86	0,632	66,55	0,273	20,34	28,3	47,11	33,73		1,54		0,43	72,56	2,73	6,63	39,59		34,89	99,66	44,00	69,63	56,81
LI		India	1 103 371 000	0,00	0,559	57,42	0,130	3,55	22,2	37,01	20,28		0,51		-0,68	60,74	3,11	8,71	34,72		3,85	2,67	19,43	18,70	19,06
LI		Indonesia	222 781 500	0,00	0,749	81,16	0,125	2,91	16,0	26,71	14,81		0,42		-0,86	58,80	3,08	8,56	33,68		8,66	17,68	23,99	25,68	24,84
LI		Kenya	34 255 720	16,48	0,673	71,57	0,251	17,81	14,0	23,29	20,55		0,01		-4,49	20,11	5,42	21,21	20,66		7,40	13,75	31,27	17,20	24,24
	L	Kiribati	99 350	100,00	0,724	78,00	0,643	63,91	17,3	28,82	46,36		5,013	d	1,61	85,10	12,55	59,72	72,41		49,82	100,00	81,09	86,20	83,65
LI	L	Laos	5 924 145	43,46	0,808	88,47	0,312	a 24,96	48,1	80,09	52,52		20,34		3,01	100,00	8,16	35,99	67,99		18,84	49,52	56,98	58,76	57,87
LI	L	Lesotho	1 794 769	61,83	1,000	100,00	0,352	29,59	16,1	26,77	28,18		0,06		-2,83	37,78	7,56	32,76	35,27		16,09	40,92	62,96	38,09	50,53
LI	L	Liberia	3 283 267	52,54	0,604	63,03	0,634	62,86	75,8	100,00	81,43		0,08		-2,52	41,14	11,28	52,88	47,01		35,17	100,00	62,39	73,51	67,95
LI	L	Madagascar	18 605 920	25,86	0,735	79,32	0,483	45,07	26,2	43,63	44,35		3,78		1,33	82,10	2,25	4,03	43,06		14,36	35,50	43,85	39,28	41,57
LI	L	Malawi	12 883 940	31,51	0,931	100,00	0,605	59,46	33,6	56,07	57,76		0,49		-0,71	60,43	10,12	46,58	53,51		13,06	31,43	55,20	42,47	48,83
	L	Maldives	329 198	87,91	0,788	86,03	0,472	43,74	7,7	12,80	28,27		13,80		2,62	95,87	4,00	13,54	54,70		5,61	8,16	72,53	31,43	51,98
LI	L	Mali	13 518 420	30,78	0,747	80,86	0,822	84,99	36,3	60,57	72,78		0,14		-1,98	46,91	6,13	25,04	35,98		11,62	26,94	53,80	31,46	42,63
LI	L	Mauritania	3 068 742	53,58	0,511	51,43	0,509	48,09	19,9	33,17	40,63		1,83		0,60	74,35	3,40	10,27	42,31		9,51	20,33	49,80	31,32	40,56
LI		Mongolia	2 646 487	55,86	0,775	84,36	0,357	30,28	20,0	33,38	31,83		0,01		-5,09	13,78	8,06	35,46	24,62		18,45	48,29	56,98	36,46	46,72
LI	L	Mozambique	19 792 300	24,91	0,759	82,43	0,631	a 62,48	21,5	35,80	49,14		3,03		1,11	79,75	7,30	31,37	55,56		11,96	27,99	45,35	41,78	43,56
LI	L	Myanmar	50 519 490	10,50	0,598	62,21	0,358	30,40	58,3	97,24	63,82		0,31		-1,17	55,50	4,97	18,76	37,13		21,64	58,24	36,76	47,69	42,22
LI	L	Nepal	27 132 630	20,06	0,758	82,20	0,304	24,01	38,0	63,39	43,70		0,60		-0,51	62,49	3,95	13,26	37,87		12,23	28,84	41,50	33,35	37,43
LI		Nicaragua	5 486 685	44,64	0,692	73,95	0,220	14,14	17,8	29,70	21,92		0,43		-0,83	59,05	8,81	39,52	49,29		13,79	33,71	46,29	41,50	43,89
LI	L	Niger	13 956 980	30,28	0,722	77,69	0,548	52,72	38,4	64,06	58,39		0,89		-0,11	66,73	12,98	62,03	64,38		14,93	37,27	49,16	50,83	49,99
LI		Nigeria	131 529 700	0,00	0,579	59,84	0,996	100,00	25,7	42,87	71,43		0,31		-1,18	55,36	3,73	12,08	33,72		28,50	79,68	32,82	56,70	44,76
LI		Pakistan	157 935 100	0,00	0,542	55,28	0,231	15,36	21,5	35,87	25,62		5,83		1,76	86,71	3,23	9,34	48,02		7,62	14,43	20,22	31,23	25,73
LI		Papua New Guinea	5 887 138	43,56	0,708	75,99	0,374	32,20	27,5	45,83	39,02		3,40		1,22	80,97	1,60	0,53	40,75		14,13	34,79	50,53	37,77	44,15
LI	L	Rwanda	9 037 690	36,97	0,849	93,69	0,395	34,75	41,3	68,84	51,79		0,11		-2,18	44,76	13,58	65,30	55,03		26,23	72,58	54,85	63,81	59,33
	L	Samoa	184 984	96,78	0,815	89,33	0,602	59,09	13,1	21,82	40,46		16,29		2,79	97,64	7,52	32,54	65,09		13,19	31,85	80,83	48,47	64,65
LI	L	Sao Tome and Principe	156 523	99,35	0,620	65,06	0,927	97,27	17,0	28,27	62,77		0,002	b	-6,38	0,00	7,03	29,87	14,94		20,41	54,40	81,63	34,67	58,15
LI	L	Senegal	11 658 170	33,05	0,561	57,58	0,290	22,32	15,1	25,17	23,75		0,57		-0,56	62,01	16,53	81,26	71,63		9,99	21,83	36,86	46,73	41,80
LI	L	Sierra Leone	5 525 478	44,54	0,594	61,72	0,857	89,07	47,9	79,78	84,42		0,253	d	-1,37	53,31	5,46	21,39	37,35		35,97	100,00	58,80	68,68	63,74
LI	L	Solomon Islands	477 742	82,18	0,764	82,94	0,437	39,65	44,9	74,86	57,26		0,32		-1,12	55,97	9,68	44,23	50,10		11,06	25,18	76,14	37,64	56,89
LI	L	Somalia	8 227 826	38,41	0,664	70,47	0,907	94,91	65,0	100,00	97,45		6,98		1,94	88,62	9,12	41,18	64,90		30,63	86,34	61,19	75,62	68,40
LI	L	Sudan	36 232 950	15,61	0,547	55,82	0,589	57,56	45,6	76,06	66,81		0,73		-0,31	64,59	8,42	37,39	50,99		25,88	71,49	38,46	61,24	49,85
LI	L	Tanzania, United Rep. of	38 328 810	14,75	0,699	74,93	0,347	29,07	41,3	68,86	48,97		0,19		-1,64	50,50	3,97	13,35	31,92		11,92	27,88	38,35	29,90	34,12
LI	L	Timor-Leste	947 064	71,66	0,469	46,08	0,259	a 18,70	30,5	50,80	34,75		0,109	d	-2,22	44,31	4,88	18,29	31,30		120,80	100,00	56,04	65,65	60,84
LI	L	Togo	6 145 004	42,90	0,592	61,52	0,318	25,64	40,8	67,98	46,81		1,58		0,46	72,83	5,47	21,45	47,14		15,49	39,03	48,53	43,08	45,81
	L	Tuvalu	10 441	100,00	0,764	82,94	0,978	100,00	18,9	31,44	65,72		5,52		1,71	86,12	21,10	100,00	93,06		42,69	100,00	87,17	96,53	91,85
LI	L	Uganda	28 816 230	19,14	0,853	94,13	0,288	22,13	30,9	51,44	36,79		0,17		-1,77	49,08	3,27	9,57	29,33		27,25	75,77	42,30	52,55	47,42
	L	Vanuatu, Republic of	211 367	94,73	0,764	82,94	0,404	35,75	21,4	35,62	35,69		5,16		1,64	85,40	8,81	39,49	62,44		15,96	40,51	77,02	51,48	64,25
LI		Viet Nam	84 238 230	2,64	0,605	63,17	0,239	16,32	20,1	33,48	24,90		1,52		0,42	72,42	2,12	3,37	37,90		21,69	58,40	23,34	48,15	35,74
LI	L	Yemen	20 974 660	24,02	0,563	57,91	0,896	93,62	14,2	23,73	58,68		1,25		0,23	70,34	5,21	20,07	45,20		16,09	40,90	41,16	43,05	42,11
LI	L	Zambia	11 668 460	33,04	0,939	100,00	0,504	47,58	20,8	34,72	41,15		0,11		-2,21	44,42	9,86	45,19	44,80		14,62	36,33	51,81	40,56	46,19

Table 2: Impact of averaging on the level of EVI, recalculated from the data of the 2006 review of the list of LDCs, regrouped in four categories of equal weight, 65 LDCs and other low income developing countries

			(1)		(2)		(3)		(4)					
			arithmetic		semi-geometric		arithmetic of logs		average of ranks		rank differences			
			values	ranks	values	ranks	values	ranks	values	ranks	1-2	1-3	1-4	2-3
LI	L	Afghanistan	60,33	52	65,22	54	41,21	46	50,67	51	-2	6	1	8
LI	L	Angola	43,44	22	43,58	21	28,45	23	22,00	21	1	-1	1	-2
LI	L	Bangladesh	25,78	5	25,87	4	13,85	4	4,33	5	1	1	0	0
LI	L	Benin	51,95	40	52,26	39	31,82	32	37,00	37	1	8	3	7
LI	L	Bhutan	46,63	29	48,86	33	33,93	37	33,00	33	-4	-8	-4	-4
LI	L	Burkina Faso	46,68	30	46,78	29	31,15	30	29,67	29	1	0	1	-1
LI	L	Burundi	59,88	50	59,93	48	46,79	53	50,33	50	2	-3	0	-5
LI	L	Cambodia	52,32	42	53,16	41	31,93	33	38,67	40	1	9	2	8
LI		Cameroon	33,08	6	33,38	6	20,34	7	6,33	6	0	-1	0	-1
	L	Cape Verde	57,92	47	58,17	45	42,43	48	46,67	46	2	-1	1	-3
LI	L	Central African Republic	50,80	39	52,81	40	40,90	45	41,33	41	-1	-6	-2	-5
LI	L	Chad	62,83	54	65,20	53	54,17	60	55,67	56	1	-6	-2	-7
LI	L	Comoros	63,60	55	66,05	56	49,66	55	55,33	55	-1	0	0	1
LI		Congo,Rep of	49,60	35	49,85	35	32,52	35	35,00	35	0	0	0	0
LI		Côte d'Ivoire	33,52	7	33,70	7	20,65	8	7,33	7	0	-1	0	-1
LI		Dem. Peo's Rep.Korea	40,19	13	40,37	13	24,62	14	13,33	13	0	-1	0	-1
LI	L	Dem. Rep. of the Congo	42,62	20	42,72	20	26,43	18	19,33	20	0	2	0	2
	L	Djibouti	60,16	51	60,17	49	40,25	41	47,00	47	2	10	4	8
LI	L	Equatorial Guinea	70,71	63	71,05	63	51,25	57	61,00	61	0	6	2	6
LI	L	Eritrea	63,99	57	66,72	59	43,57	49	55,00	54	-2	8	3	10
LI	L	Ethiopia	39,32	12	39,81	12	23,55	11	11,67	12	0	1	0	1
LI	L	Gambia	55,68	43	55,71	42	40,33	42	42,33	42	1	1	1	0
LI		Ghana	41,50	15	41,56	15	25,31	15	15,00	14	0	0	1	0
LI	L	Guinea	34,58	9	35,33	9	23,37	10	9,33	10	0	-1	-1	-1
LI	L	Guinea-Bissau	66,18	60	66,46	57	53,55	59	58,67	59	3	1	1	-2
LI	L	Haiti	56,81	44	58,76	46	46,63	52	47,33	48	-2	-8	-4	-6
LI		India	19,06	1	19,06	1	10,27	1	1,00	1	0	0	0	0
LI		Indonesia	24,84	3	24,84	3	13,22	2	2,67	2	0	1	1	1
LI		Kenya	24,24	2	24,56	2	14,89	5	3,00	3	0	-3	-1	-3
	L	Kiribati	83,65	64	83,85	64	74,95	64	64,00	64	0	0	0	0
LI	L	Laos	57,87	46	57,88	44	41,30	47	45,67	44	2	-1	2	-3
LI	L	Lesotho	50,53	38	52,11	38	35,71	39	38,33	39	0	-1	-1	-1
LI	L	Liberia	67,95	61	68,43	60	61,08	63	61,33	62	1	-2	-1	-3
LI	L	Madagascar	41,57	16	41,61	16	26,64	19	17,00	16	0	-3	0	-3
LI	L	Malawi	48,83	34	49,23	34	37,66	40	36,00	36	0	-6	-2	-6
	L	Maldives	51,98	41	56,60	43	40,85	44	42,67	43	-2	-3	-2	-1
LI	L	Mali	42,63	21	43,72	23	32,84	36	26,67	27	-2	-15	-6	-13
LI	L	Mauritania	40,56	14	41,29	14	27,61	20	16,00	15	0	-6	-1	-6
LI		Mongolia	46,72	31	47,71	31	31,39	31	31,00	31	0	0	0	0
LI	L	Mozambique	43,56	23	43,59	22	29,64	27	24,00	24	1	-4	-1	-5
LI	L	Myanmar	42,22	19	42,48	19	24,61	13	17,00	16	0	6	3	6
LI	L	Nepal	37,43	11	37,56	11	24,23	12	11,33	11	0	-1	0	-1
LI		Nicaragua	43,89	24	43,94	24	28,07	22	23,33	22	0	2	2	2
LI	L	Niger	49,99	37	50,00	36	34,74	38	37,00	37	1	-1	0	-2
LI		Nigeria	44,76	26	46,06	27	26,27	17	23,33	22	-1	9	4	10
LI		Pakistan	25,73	4	25,93	5	13,48	3	4,00	4	-1	1	0	2
LI		Papua New Guinea	44,15	25	44,52	25	29,17	24	24,67	25	0	1	0	1
LI	L	Rwanda	59,33	49	59,58	47	40,76	43	46,33	45	2	6	4	4
	L	Samoa	64,65	59	68,57	61	49,84	56	58,67	59	-2	3	0	5
LI	L	Sao Tome and Principe	58,15	48	65,36	55	43,81	50	51,00	52	-7	-2	-4	5
LI	L	Senegal	41,80	17	42,00	17	28,02	21	18,33	19	0	-4	-2	-4
LI	L	Sierra Leone	63,74	56	64,08	52	57,91	62	56,67	57	4	-6	-1	-10
LI	L	Solomon Islands	56,89	45	61,43	51	44,48	51	49,00	49	-6	-6	-4	0
LI	L	Somalia	68,40	62	69,24	62	54,27	61	61,67	63	0	1	-1	1
LI	L	Sudan	49,85	36	51,16	37	29,66	28	33,67	34	-1	8	2	9
LI	L	Tanzania, United Rep. of	34,12	8	34,26	8	21,60	9	8,33	8	0	-1	0	-1
LI	L	Timor-Leste	60,84	53	61,14	50	53,05	58	53,67	53	3	-5	0	-8
LI	L	Togo	45,81	27	45,88	26	29,42	25	26,00	26	1	2	1	1
	L	Tuvalu	91,85	65	93,33	65	93,29	65	65,00	65	0	0	0	0
LI	L	Uganda	47,42	32	47,67	30	29,45	26	29,33	28	2	6	4	4
	L	Vanuatu, Republic of	64,25	58	66,61	58	47,36	54	56,67	57	0	4	1	4
LI		Viet Nam	35,74	10	36,95	10	17,16	6	8,67	9	0	4	1	4
LI	L	Yemen	42,11	18	42,11	18	25,80	16	17,33	18	0	2	0	2
LI	L	Zambia	46,19	28	46,48	28	32,32	34	30,00	30	0	-6	-2	-6
LI		Zimbabwe	47,90	33	48,02	32	30,60	29	31,33	32	1	4	1	3
		Averages												
		50 LDC's	53,33	38,20	54,44	38,18	39,36	38,52	38,30	38,28	1,30	3,96	1,56	4,02
		15 other low income	36,99	15,67	37,36	15,73	22,53	14,60	15,33	15,07	0,20	1,87	0,73	1,93
		65	49,56	33,00	50,50	33,00	35,48	33,00	33,00	32,92	1,05	3,48	1,37	3,54
		Medians												
		50 LDC's	51,96	40,50	52,98	40,50	38,96	40,50	40,00	40,50	1,00	3,00	1,00	4,00
		15 other low income	40,19	13,00	40,37	13,00	24,62	14,00	13,33	13,00	0,00	1,00	0,00	1,00
		65	47,90	33,00	48,86	33,00	31,93	33,00	33,00	33,00	1,00	2,00	1,00	3,00

Table 3: Average and median values of EVI for broad groups and regions, from the 2006 review of the list of the LDCs

EVI, 2006 review	Population, 2005		Remoteness		Export concentration 2003 or latest year (Main source: UNCTAD)		shares of agriculture, etc. 2003 or 2004		Specialisation index	% homeless 1990-2004			Agricultural instability 1979-2004		Natural shock index	Export instability 1979-2004 trade shock index		exposure index	shock index	EVI
	values	Max-min	Indice	Max-min	values	Max-min	values	Max-min		values	logs	Max-min	values	Max-min		values	Max-min			
Least developed countries (50)																				
average	15 187 782	46,49	0,692	73,57	0,548	52,63	32,62	53,42	53,02	2,20	-0,48	62,86	8,08	35,45	49,16	22,69	54,37	54,89	51,76	53,33
median	8 333 340	38,22	0,675	71,84	0,507	47,84	33,44	55,73	49,64	0,54	-0,61	61,42	7,16	30,62	46,98	17,74	46,05	52,80	49,46	51,96
Low income EIT (8)																				
average	13 118 982	38,49	0,529	53,67	0,388	33,87	21,24	35,41	34,64	1,05	-1,63	50,59	7,86	34,37	42,48	15,52	39,12	41,32	40,80	41,06
median	5 885 387	43,65	0,641	67,59	0,395	34,68	19,80	33,00	38,24	0,88	-0,18	66,08	6,90	29,19	46,91	12,11	28,48	44,02	36,48	43,49
Other low income (15)																				
average	122 947 746	22,95	0,659	69,51	0,360	30,20	21,38	35,64	32,92	1,36	-0,94	57,98	5,18	19,90	38,94	14,16	34,87	37,08	36,90	36,99
median	22 112 810	23,21	0,605	63,17	0,251	17,81	21,52	35,87	31,83	0,51	-0,68	60,74	3,73	12,08	37,90	13,84	33,86	38,49	37,77	40,19
Least developed and other low income (65)																				
average	40 055 466	41,06	0,684	72,64	0,504	47,45	30,03	49,31	48,38	2,01	-0,58	61,73	7,41	31,86	46,80	20,72	49,87	50,78	48,33	49,56
median	9 402 098	36,36	0,664	70,47	0,459	42,28	27,50	45,83	46,29	0,51	-0,67	60,83	6,48	26,92	44,95	16,09	40,90	49,76	46,03	47,90
Developing countries excluding EIT (132)																				
average	39 078 767	44,82	0,657	69,16	0,441	40,10	19,27	31,75	35,93	1,48	-1,49	52,05	7,65	32,62	42,34	16,89	39,61	48,68	40,97	44,83
median	7 376 119	40,10	0,658	69,72	0,400	35,25	14,71	24,52	34,29	0,41	-0,88	58,58	6,53	27,20	41,37	13,48	32,74	47,91	38,04	43,13
Developing excluding EIT and LDC (82)																				
average	53 646 441	43,80	0,636	66,47	0,376	32,46	11,13	18,54	25,50	1,04	-2,11	45,46	7,39	30,90	38,18	13,35	30,61	44,89	34,39	39,64
median	6 802 758	41,34	0,649	68,60	0,314	25,14	9,20	15,34	22,12	0,34	-1,09	56,30	5,88	23,66	39,27	11,58	26,81	41,36	32,40	39,10
SIDS (33)																				
average	1 499 803	80,93	0,672	71,52	0,476	44,11	15,66	25,70	34,90	2,30	-1,26	54,58	8,56	37,99	46,28	20,45	44,27	67,07	45,28	56,17
median	329 198	87,91	0,651	68,89	0,425	38,18	10,37	17,28	33,73	0,41	-0,89	58,51	8,47	37,67	50,10	14,06	34,55	70,24	42,74	56,49
Landlocked developing (31)																				
average	12 201 110	39,61	0,764	80,97	0,455	41,73	27,78	46,30	44,01	1,15	-1,88	47,96	8,56	38,15	43,05	17,33	44,24	51,05	43,64	47,35
median	8 410 801	38,07	0,766	83,30	0,419	37,52	28,80	48,00	44,63	0,25	-1,40	53,02	7,76	33,86	43,69	14,93	37,27	52,33	40,56	46,68
EIT low income (8)																				
average	13 118 982	38,49	0,529	53,67	0,388	33,87	21,24	35,41	34,64	1,05	-1,63	50,59	7,86	34,37	42,48	15,52	39,12	41,32	40,80	41,06
median	5 885 387	43,65	0,641	67,59	0,395	34,68	19,80	33,00	38,24	0,88	-0,18	66,08	6,90	29,19	46,91	12,11	28,48	44,02	36,48	43,49
African LDC's (34)																				
average	13 415 629	42,58	0,688	72,89	0,589	57,51	34,27	55,72	56,62	1,00	-0,92	58,15	8,16	35,98	47,07	20,45	53,93	53,67	50,50	52,08
median	8 738 272	37,50	0,661	70,12	0,570	55,25	34,28	57,13	55,12	0,42	-0,87	58,66	7,16	30,62	45,88	17,74	46,05	51,01	48,72	50,26
Other African countries (18)																				
average	24 857 133	36,82	0,600	61,33	0,474	43,73	13,45	22,42	33,07	0,43	-2,55	40,77	7,26	31,15	35,96	13,95	34,21	42,01	35,09	38,55
median	14 665 695	29,62	0,619	64,88	0,419	37,54	11,27	18,78	32,53	0,12	-2,13	45,26	6,21	25,45	35,22	14,20	34,99	38,71	34,78	37,76
All African countries (52)																				
average	17 376 150	40,58	0,658	68,89	0,549	52,74	27,07	44,19	48,47	0,80	-1,49	52,13	7,85	34,31	43,22	18,20	47,10	49,63	45,16	47,40
median	9 575 515	36,08	0,646	68,31	0,528	50,32	24,40	40,67	46,97	0,30	-1,19	55,29	7,01	29,78	42,91	15,79	39,97	49,78	43,79	46,43

Table 4: A retrospective EVI from 1970, for main groups and regions, by decades and five year periods

		Decades			Five Years						
		70-79	80-89	90-99	70-74	75-79	80-84	85-89	90-94	95-99	2000-
Developing countries	Moy	5,55	5,19	4,69	5,17	5,57	5,52	4,49	4,45	4,15	3,49
	Nbo	*(75)*	*(86)*	*(105)*	*(77)*	*(80)*	*(88)*	*(100)*	*(107)*	*(111)*	*(114)*
	Sd	4,04	2,44	4,56	4,59	4,26	2,98	2,39	3,72	5,49	3,83
	Median	4,39	4,47	3,96	3,50	4,31	5,10	3,98	3,52	2,79	2,58
LDCs	Moy	5,61	5,62	6,03	5,31	6,55	6,24	4,95	5,03	5,83	3,93
	Nbo	*(24)*	*(26)*	*(40)*	*(24)*	*(26)*	*(27)*	*(35)*	*(41)*	*(44)*	*(45)*
	Sd	2,89	2,87	6,85	3,31	4,65	3,49	2,73	3,81	8,16	3,95
	Median	4,77	4,60	4,21	3,92	5,00	5,39	4,19	4,22	3,36	2,79
Non LDCs	Moy	5,52	5,01	3,87	5,10	5,09	5,20	4,24	4,10	3,05	3,20
	Nbo	*(51)*	*(60)*	*(65)*	*(53)*	*(54)*	*(61)*	*(65)*	*(66)*	*(67)*	*(69)*
	Sd	4,51	2,22	1,84	5,09	4,01	2,70	2,17	3,65	1,93	3,76
	Median	3,99	4,47	3,50	3,24	3,70	5,10	3,57	3,06	2,62	2,48
SIDs	Moy	6,22	5,98	4,22	6,09	7,11	6,72	4,50	4,15	3,38	3,14
	Nbo	*(11)*	*(18)*	*(25)*	*(11)*	*(13)*	*(19)*	*(25)*	*(25)*	*(26)*	*(27)*
	Sd	3,76	3,15	2,00	4,59	5,72	4,08	2,52	2,15	2,56	2,47
	Median	4,55	4,91	3,98	3,93	4,58	6,03	3,42	3,37	3,01	2,79
Non SIDs	Moy	5,43	4,99	4,83	5,01	5,27	5,19	4,48	4,55	4,39	3,60
	Nbo	*(64)*	*(68)*	*(80)*	*(66)*	*(67)*	*(69)*	*(75)*	*(82)*	*(85)*	*(87)*
	Sd	4,11	2,19	5,11	4,60	3,89	2,54	2,36	4,09	6,11	4,17
	Median	4,36	4,47	3,80	3,34	4,31	4,90	4,11	3,53	2,76	2,48
LDCs non SIDs	Moy	5,25	5,04	6,49	4,90	5,64	5,34	5,00	5,31	6,26	3,97
	Nbo	*(22)*	*(22)*	*(31)*	*(22)*	*(22)*	*(22)*	*(27)*	*(32)*	*(35)*	*(35)*
	Sd	2,13	2,12	7,63	2,36	3,07	2,31	2,65	4,11	8,96	4,07
	Median	4,77	4,41	4,25	3,92	4,72	4,87	4,19	4,23	3,29	2,88
LICs	Moy	5,74	5,27	5,65	4,98	5,75	5,72	4,42	4,62	5,54	3,72
	Nbo	*(36)*	*(37)*	*(49)*	*(36)*	*(37)*	*(37)*	*(44)*	*(50)*	*(53)*	*(53)*
	Sd	2,85	2,38	6,32	3,16	3,21	2,62	2,49	3,63	7,58	3,74
	Median	4,95	4,77	4,16	3,88	4,76	5,39	4,12	3,58	3,29	2,71
Non LICs	Moy	5,37	5,13	3,84	5,33	5,41	5,38	4,54	4,31	2,88	3,30
	Nbo	*(39)*	*(49)*	*(56)*	*(41)*	*(43)*	*(51)*	*(56)*	*(57)*	*(58)*	*(61)*
	Sd	4,93	2,50	1,71	5,58	5,02	3,24	2,33	3,83	1,53	3,93
	Median	3,45	4,43	3,56	3,24	3,69	5,10	3,85	3,10	2,66	2,51
SIDs non LDCs	Moy	5,47	5,16	4,10	5,26	5,13	5,47	4,36	4,22	2,97	2,75
	Nbo	*(9)*	*(14)*	*(16)*	*(9)*	*(9)*	*(14)*	*(17)*	*(16)*	*(17)*	*(17)*
	Sd	2,53	2,21	1,65	3,30	2,60	2,90	2,25	2,07	1,78	1,35
	Median	4,55	4,35	3,87	3,93	4,19	5,17	3,42	3,57	2,62	2,96
SIDs LDCS	Moy	9,60	8,82	4,43	9,84	11,57	10,21	4,79	4,03	4,16	3,81
	Nbo	*(2)*	*(4)*	*(9)*	*(2)*	*(4)*	*(5)*	*(8)*	*(9)*	*(9)*	*(10)*
	Sd	7,88	4,58	2,62	9,48	8,65	5,18	3,18	2,42	3,62	3,69
	Median	9,60	8,67	4,09	9,84	9,45	10,14	3,78	3,23	3,38	2,78
LDCs / Non LDCs	*Wilcoxonn-z*	-1,27	-0,96	-1,57	-1,61	-2,00	-1,27	-1,20	-1,42	-1,81	-0,85
	pvalue-z	0,203	0,335	0,116	0,108	0,046	0,205	0,229	0,157	0,071	0,396
LICs / Non LICs	*Wilcoxonn-z*	-2,07	-0,49	-1,36	-1,28	-1,78	-0,96	0,30	-0,28	-1,68	-0,41
	pvalue-z	0,038	0,622	0,174	0,202	0,076	0,337	0,765	0,779	0,093	0,685
	Wilcoxonn-z	-1,13	-1,11	-0,45	-1,10	-1,32	-1,25	0,21	-0,58	0,11	-0,10
SIDs / Non SIDs	pvalue-z	0,258	0,265	0,652	0,272	0,186	0,212	0,833	0,561	0,909	0,918
	Wilcoxonn-z	-0,38	-0,64	0,69	-0,29	-0,27	-0,78	0,92	0,50	0,89	0,43
SIDs / LDCs non SIDs	pvalue-z	0,703	0,523	0,489	0,775	0,785	0,433	0,360	0,618	0,374	0,665
	Wilcoxonn-z	0,94	1,70	0,17	0,47	1,54	2,04	0,00	-0,40	1,00	0,10
SIDs non LDCs / LDCs	pvalue-z	0,346	0,089	0,865	0,637	0,123	0,042	1,000	0,692	0,319	0,920
	Wilcoxonn-z	0,04	0,45	0,63	0,02	0,87	0,71	0,79	0,18	1,25	0,43
SIDs non LDCs/SIDs LDC	pvalue-z	0,968	0,650	0,526	0,984	0,385	0,475	0,429	0,859	0,213	0,664