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ON THE ECONOMIC VULNERABILITY

OF LOW INCOME COUNTRIES (*)

by

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Summary

This paper examines the relevance of the economic vulnerability concept for low-income countries, a topic of recent concern in several international bodies. It first proposes some conceptual clarifications and a method to build an internationally comparable indicator. Three factors of vulnerability are identified: shocks, exposure and resilience or capacity to react (the first two ones being more structural, the third one more related to policy). To measure the two main kinds of shocks (natural and external), proposed proxies are respectively the instability of agricultural production and the instability of the purchasing power of exports, while the (smallness of) the population size can be used as a proxy for (structural) exposure. To aggregate the various possible indicators of shocks and exposure in a composite index of *structural* economic vulnerability, weights can be drawn from their estimated impact on growth.

Secondly, some selected issues related to the impact of vulnerability on growth are considered: "primary" instabilities (natural events, terms of trade, political troubles) are found to slow growth, more by their effect on the total factor productivity growth than on the rate of investment, to do so through "intermediate" instabilities (of the rate of investment and of the real exchange rate), and in agricultural economies through their impact at the farmer level.

Thirdly, besides its negative effects on growth, vulnerability is assumed to increase aid effectiveness: the more the recipient country is vulnerable the more aid contributes to growth. Implications are drawn for aid allocation and aid design.

Keywords: Economic vulnerability, shocks, exposure, resilience, instabilities, productivity, growth, aid

Résumé

Cet article examine la pertinence du concept de vulnérabilité économique pour les pays à faible revenu, question qui a récemment retenu l'attention de diverses institutions internationales. Il propose d'abord quelques clarifications conceptuelles et une méthode pour construire un indicateur internationalement comparable. Trois facteurs de vulnérabilité sont identifiés : les chocs, l'exposition au chocs et la résilience ou capacité de réaction (les deux premiers éléments étant plutôt structurels, le troisième, plus lié à la politique). Pour mesurer les deux grandes catégories de chocs (naturels et externes), deux variables approchées sont respectivement proposées, l'instabilité de la production agricole et l'instabilité du pouvoir d'achat des exportations. La (faible) dimension de la population peut être utilisée comme variable approchée de l'exposition structurelle aux chocs. Afin d'être agrégés en un indice composite de vulnérabilité structurelle, les différents indicateurs possibles de chocs et d'exposition aux chocs peuvent être pondérés par leur impact estimé sur la croissance.

Quelques propositions relatives à l'effet de la vulnérabilité sur la croissance sont ensuite examinées : les instabilités "primaires" (évènements naturels, termes d'échange, troubles politiques) apparaissent ralentir la croissance, le faire plus par leur effet sur la productivité du capital que sur le taux d'investissement, le faire à travers des variables "intermédiaires" d'instabilité (du taux d'investissement et du taux de change réel), et dans les économies agricoles le faire à travers leur impact au niveau des exploitations agricoles. A côté de ses effets négatifs sur la croissance, la vulnérabilité est supposée accroître l'efficacité de l'aide : plus un pays est vulnérable, plus l'aide contribue à la croissance. Des implications en sont tirées pour l'allocation et la conception de l'aide.

Mots-clés : Vulnérabilité économique, chocs, exposition, résilience, productivité, croissance, aide

1 – INTRODUCTION: SOURCES OF RECENT INTEREST IN ECONOMIC VULNERABILITY

Economic vulnerability of developing countries is not really a new concept, but it has recently become a fashioned one, noticeably because of the concern of several international political bodies and the "turmoil" of international economy.

First, small island developing states (SIDS) have expressed their concern about their presumed high level of vulnerability. Following the 1994 Barbados Conference on Sustainable Development of Small Island Developing States which asked 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 United Nations General Assembly, at its 51st Session in 1997, requested the Secretary General to prepare a report on the vulnerability index and the Committee for Development Planning (CDP) to examine this index.[1] Advice was actually given in May 1999 by the Committee for Development Policy (new CDP), which after considering several available indicators, proposed a new and relatively simple index (United Nations, 1999).

Second, in its 52nd Session (December 1997), the United Nations General Assembly [2] requested the CDP to consider "the usefulness of the vulnerability index as a criterion for the designation of the Least Developed Countries" (LDCs). As the CDP in May 1998 postponed its conclusions pending on the additional work needed on the vulnerability index, the ECOSOC (in July 1998) again urged CDP to assess the usefulness of a vulnerability index as a criterion for the designation of LDCs[3]). This was done by the new CDP in April 1999 (United Nations, 1999): the new "economic vulnerability index" referred to above was proposed as one of the criteria to be used for the identification of LDCs, instead of the former

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[1] The report (presented in February 1998) took note of the work done on that matter by an ad hoc expert group and a working group of CDP held in December 1997 (both considering several indicators and concluding that further work was needed). In mid 1998, the UN Commission on Sustainable Development urged the CDP to present its conclusion and other UN bodies to accord priority to work on vulnerability of SIDS. In May 1998 the CDP gave consideration to the vulnerability index but requested more statistical backward work in order to formulate its advice at its next session (1999). In the meanwhile, several meetings were held on such topics, noticeably on the initiative of the Commonwealth Secretariat and of UN Secretariat.

[2] in accordance with the own suggestions of the Committee in May 1997.

[3] and to consider the work of all other international agencies on the vulnerability of Small States. This issue was rendered more acute by the 1997 CDP proposal to graduate Vanuatu of the list of LDCs in application with the present graduation criteria. UNGA in its 52nd session (December 1997) postponed its decision regarding Vanuatu, asking the CDP to reassess the graduation of Vanuatu according to its examination of criteria and the possible inclusion of a vulnerability index.

"economic diversification index"[4]. Besides the other two previous criteria are the level of GDP per capita and an indicator of human resources, the APQLI (Augmented Physical Quality of Life Index). The ECOSOC requested some "diagnostic and testing" of this new indicator before applying this new set of criteria to the 2000 review of the list of LDCs[5]. The CDP, in its 2000 report, relying on the work done by an expert group, confirmed its proposal, implemented the economic vulnerability index as a criterion for LDCs identification and proposed a revised list of LDCs. This list was endorsed in July 2000 by ECOSOC, which however postponed the consideration of one country proposed for graduation from the list of LDCs.

Thirdly, an international task force has been requested at the initiative of the World Bank to make proposals on the ways by which commodity dependent economies can manage the risks they face in a market based approach. Such proposals are directly intended to cope with the vulnerability of these economies and so involve to assess their vulnerability (World Bank, 1999).

Finally, at about the same time the "Asian crisis" made it clear that not only small island developing states, LDCs, and/or commodity dependent economies might be vulnerable. Many comments and analyses of the causes of this crisis have underlined the vulnerability of some emerging countries, which before the crisis registered a high level of capital inflows with a weak financial structure. For instance, some authors have tried to assess the risk of a financial crisis (Berg and Patillo, 1999), others to estimate the factors of GDP growth volatility (Easterly, Islam, Stiglitz, 2000, Combes and alii, 2000).

Thus in various contexts the concept of vulnerability appeared to be a relevant one and became fashionable. Indeed the above examples point to the need for a clear concept of economic vulnerability that could be measurable according to largely acceptable methods and be used for different purposes. We here limit our considerations to the low-income countries and focus both on the LDCs (to be identified partly through their vulnerability) and on the commodity dependent economies (which often evidence a high vulnerability)[6]. We simultaneously focus, as it will appear, on structural economic vulnerability, rather than on policy induced vulnerability.

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[4] On all the previous points, see the last reports of the Committee for Development Planning (1998) and of the Committee for Development Policy (1999).
[5] The list is reviewed every three years, its previous review occurred in 1997.
[6] Of course, other categories of countries may evidence a high vulnerability, noticeably the small islands.

2 – THE CONCEPT AND MEASUREMENT OF ECONOMIC VULNERABILITY

2.1 – Definition of vulnerability

Vulnerability means the risk of being harmed or wounded (negatively affected) by unforeseen events, in general and in economics as well. In economic terms, these unforeseen events are often called "shocks": economic vulnerability is a vulnerability to shocks of any kind, a susceptibility to exogenous shocks. As such the concept of economic vulnerability needs clarification, first about its consequences which are referred to (static or dynamic), second about its sources (what kind of events?) and third about its difference from other more or less proximate notions.

Static or dynamic notion of vulnerability

If vulnerability is the risk to be harmed by shocks, a first question is how to measure the harmfulness. It could be the immediate losses of welfare resulting from a shock. When successive and opposite shocks of equal size occur, the loss associated to the instability of income is due only to the decreasing marginal utility of income.

Of main concern are the possible negative effects of the shocks on growth and development, which refers to a dynamic definition of vulnerability. It then can be said that vulnerability is the risk of economic growth to be markedly and/or durably reduced by shocks (or the risk of the long-term average rate of growth to be reduced by shocks)[7]. Indeed most of the international debate about vulnerability, noticeably the consideration of vulnerability as a major handicap to growth in the search of criteria for LDCs identification, implicitly refers to this dynamic meaning. Another dynamic definition, somewhat broader, would be related to the likelihood of negative effects of shocks on poverty reduction.

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[7] At first glance vulnerability (with regard to growth) may appear simply as the opposite of the sustainability of growth, a concept even more extensively used: the more vulnerable a country, the less sustainable its growth, ceteris paribus. But the sustainability of growth not only (negatively) depends on the vulnerability to shocks, but also result from more permanent factors, such as the rate of human and physical capital accumulation, and the natural resources preservation.

Main kinds of shocks

At first glance, the sources of vulnerability (the shocks) could be classified into three categories:

- environmental or "natural" shocks, namely natural disasters such as earthquakes, volcanic eruptions, typhoons and hurricanes, droughts, etc.

- other external (trade and exchange related) shocks[8], such as slumps in external demand, world commodity prices instability (and correlated instability of terms of trade), international fluctuations of interest rates, etc..

- other (i.e. non-environmental) domestic shocks, notably those generated by political instability, or more generally by unforeseen political changes. This kind of shocks however cannot be considered in the same way, as far as they are more "endogenous", or less independent from the "country will".

Economic vulnerability and ecological fragility

In the United Nations, initial concern about vulnerability, both economic vulnerability and ecological fragility were considered in an integrated way (cf. supra). But it rapidly became clear that the two notions should be analysed separately. For instance, losses in biodiversity, which reflect ecological fragility and need to be analysed for themselves are not necessarily major elements of economic vulnerability. This difference was clearly recognised by the ad hoc expert group commissioned by the UN about vulnerability (and was reaffirmed by the CDP). But this group also considered that economic vulnerability could be induced by natural factors, let us say by the environment ("the relative susceptibility of economies to damage caused by natural disasters"). So the environment induced economic vulnerability can be considered either as a part of economic vulnerability or as a part of ecological vulnerability (the other part of which is the "ecological fragility")[9]/[10].

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8 We suppose the developing countries to be rather small and price taker, so that the instability of prices for the commodities they export be exogenous.

9 The most comprehensive attempt to build an "environmental vulnerability index" was undertaken by SOPAC (South Pacific Applied Geoscience Commission), cf Kaly and alii, 1999.

[10] The same ambiguity appears with the concept of sustainable development which covers both the sustainability of economic growth and the sustainability of environment, since natural resources depletion may threaten growth as well as the environment.

Economic vulnerability and economic handicaps

Many developing countries suffer from handicaps, not all of which can be considered as vulnerability. Remoteness from large markets, landlockedness and related high transportation costs may indeed be serious structural handicaps to growth, as well as low level of human resources, but are not as such elements of vulnerability, because they are not unforeseen events. Of course, as any social and economic feature, they may influence the consequences of a given shock. An unjustified extension of the concept of vulnerability to structural economic features, such as the distance from markets or the low level of human capital, which are presumed to permanently –and foreseeably- affect the rate of growth, often appears in the literature[11].

On being an island: remoteness, size and climatic instability

The discussion on the concept of vulnerability seems to have been often small island driven, as it appears in the UN resolutions and several works written on it. Of course, as far as one intends to enlighten a presumed higher level of vulnerability of SIDS (Small Islands Developing States), the concept has to be applicable to other States as well. But it also needs to capture the specific aspects of islands vulnerability[12]. Let us consider the three features often presented as the basis of island vulnerability: distance from main markets, small size and climatic instability. The first feature, as we have seen, may be a structural handicap, but not necessarily a vulnerability element, whereas small size and climatic instability, as we shall see, are actually major sources of vulnerability. But many countries other than islands evidence one or the other of these two last features, which in turn may not be found together in all islands.

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[11] For instance Briguglio retains "remoteness" as a component of this vulnerability index. However, as noted by Encontre (1999) who clearly distinguishes shocks and handicaps, remoteness may delay the arrival of basic goods when needed and this increases vulnerability.

[12] Several attempts to build indicators of vulnerability have been focused on the situation of small islands or more generally of small states (Briguglio 1995, 1997, Crowards 1999, Atkins and alii 1998, 2000 Easter 1999).

2.2 – Three vulnerability components: shock, exposure, resilience

The risk of a country to be wounded by unforeseen events (shocks) can be broken down in three components:[13]

    a - the size and likelihood of the *shocks*

    b - the *exposure* to the shocks

    c - the countries capacity to react to the shocks, or its "*resilience*"

We note that the concept of resilience is largely used in some works more specifically oriented towards the environmental or natural sources of vulnerability (cf. Kaly and others, SOPAC 1998). A distinction close to the previous one can be found in Rodrik (1999) who, looking for the risk of social conflict in countries facing external shocks, considered separately the 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.

The case of a commodity exporter

Consider, for instance, a small country that is a primary commodity exporter. Its vulnerability to trade shocks results first from the world prices fluctuations (reflected by the instability of its terms of trade), second from the exposure to the shocks expressed by the ratio of (commodities) export to GDP, and third from the capacity of the country to efficiently manage such shocks.   The size of the shocks for a small country (price-taker), let us say the level of its export price instability, is clearly an exogenous factor of instability. The resilience, or the capacity to manage instability, clearly depends on the policy pursued. The exposure to the shocks is more ambiguous: it is mainly a structural factor, but to some extent it is also dependent on policy. For instance, the export to GDP ratio mainly depends on the population size, the level of income per capita, the possible landlocked location, the possible mineral exports, factors which do not reflect the present policy, but also on the policy itself (more or less open or outward looking). We come back later to this question, when discussing the measurement of vulnerability indicators.

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[13] Such a decomposition can be used for various topics, for instance for any expansion or recession transmission from one area to another one (cf. Guillaumont 1985). It has initially been used for the transmission of US recessions to European countries during the post-war period where the three components were named sensitivity, dependence and receptivity (Guillaumont 1981).

Structural vulnerability versus policy related vulnerability

Thus an important distinction concerning vulnerability must be made between structural vulnerability, which results from factors that are durably independent from the political will of countries, and the vulnerability deriving from policy, which results from recent choices, and is therefore (more) conjunctural. For instance, the vulnerability of the Asian countries, which has been so often underlined after the 1997 crisis, is very different from the vulnerability of small economies which export raw materials or of small islands. It is less structural and more political, or more conjunctural [14]. This feature is clearly evidenced when vulnerability is measured by the probability of a financial crisis, estimated mainly from financial and policy variables (Berg and Patillo, 1999, Bussiere and Mulder, 1999). If one wants to utilise a vulnerability index for selecting certain countries and providing them with a durable support by the international community. It is naturally the structural vulnerability that must be measured, which itself essentially results from two elements: the extent of the shocks that can arise and the exposure to such shocks[15].

Vulnerability at the macro and micro level

We have previously referred to the vulnerability at the macrolevel, i.e. vulnerability of the economy as a whole. But of course what mainly matters is the vulnerability of people, especially of the poor. It is clear that to the vulnerability of the global economy in low-income countries is associated with vulnerability at the micro level, depending on how shocks are passed through within the economy and on the people's life. Vulnerability of people has three main components: the shocks on the people incomes, which depend on the shocks, exposure and resilience at the macro level; the exposure of people to these shocks, and their capacity to react, i.e. their own resilience. Conversely, if people appear to be vulnerable, it will be reflected by a low resilience at the macro level.

Let us illustrate this by the example of a fall of the world price of a main export crop. The macro vulnerability depends on the size of the fall, on the share of the related crop

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[14] Such a vulnerability has been measured as a probability of financial crisis, estimated mainly from financial and political variables (see for instance Berg and Pattillo 1999, Bussiere and Mulder 1999)

[15] Structural vulnerability, besides the low level of human resources, is one of the two main structural handicaps to growth. The growth sustainability (cf supra footnote 7, p. 4) depends on these two structural factors, and of course on the quality of the policy and on the likelihood of good policy to be durable.

exports in GDP and on the capacity of the country to manage this shock relatively to GDP. The vulnerability at the micro level, let us say at the farmer level, depends (1) on the size of the producer price fall, which itself results from the world price fall, the domestic processing of the product and from its public taxation, (2) on the number of farmers concerned and on the share in their total income of the crop the price of which is falling (exposure), and (3) on their capacity to insure, to borrow or to draw on their own assets, in order to compensate the loss of income and maintain their level of basic needs fulfilment.

2.3 – Main sources of vulnerability of low-income countries and related indicators

Indicators of (structural) economic vulnerability must be drawn from the identification of shocks likely to affect low-income countries. They of course also need to be largely available and reliable….

Climatic and natural shocks: the instability of agricultural production

Climatic and natural shocks are a main source of vulnerability in many developing countries and cover a large variety of events: earthquakes, typhoons or hurricanes, floods, droughts, insects' invasions, etc. An indicator of the risk of natural catastrophes might be drawn up on the basis of an index of the frequency of such events, measured over a longer period of time. An alternative indicator would be the average proportion of the population affected by these events. Such indicators or similar indices have been used by some authors as a component of a vulnerability index (for instance Atkins and alii 1998)[16]. Unfortunately these data are not available for all countries and a long enough period of time, which makes a problem statistically speaking.

Moreover the potential negative impact of these very different events may differ from one to the other, and even within one kind of event (more or less severe droughts, cyclones, etc.). Weighting by the number of people affected - if it is known - does not solve the problem, since people may be more or less severely affected (some will die, others will be displaced for some weeks, etc.). Of course, measuring the economic losses resulting from

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[16] The main source of the data is the Emergency Events Data base, compiled by the Center for Research on Epidemiology of Disaster at the School of Public Health, Université Catholique de Louvain.

these events in all the developing countries concerned would give a good indicator but it seems to be an impossible task[17].

For these reasons a proxy of these natural shocks (all of them are not "disasters")[18] has to be looked for. It can be found in the measurement of the instability of agricultural production with regard to its trend value (and in percentage of this one). Whereas the trend, if significantly measurable (cf. infra), of agricultural production may be supposed to mainly depend on the economic policy pursued and on permanent factors, the fluctuations around the trend may be supposed to reflect the occurrence and severity of natural shocks, which are likely to affect agricultural production[19]. For these reasons this indicator has been proposed by the CDP as a component of a new economic vulnerability index to be used for LDCs identification (United Nations, 1999, 2000).

Trade shocks: the instability of real export proceeds

Another main source of vulnerability stands in foreign trade, even if an open trade is in itself a factor of development. An indication of this kind of vulnerability may be given by the instability of the real export proceeds with regard to its trend. We have to consider here all the exports of goods and services, because shocks can affect good exports and service exports as well, which in general are a large part of the export receipts in small (and vulnerable) countries[20]. (Some private transfer, such as migrant remittances could also be included).

We assume that for small (i.e. price taker) countries this instability is structural, i.e. resulting from exogenous events, namely fluctuations in world prices, in external demand and in domestic events not related to policy (for instance climatic shocks). Of course, some fluctuations of the export volume with regard to its trend may be due to the instability of the

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[17] An attempt however is due to UNDRO (1990), a data base used by Briguglio 1995. Indicators relying on these data bases are criticized by Crowards (1999).

[18] Recurrent droughts in Sahelian countries are an important source of negative shocks, but most often not registered as "disasters". For instance, Senegal, a new country proposed for the inclusion on the list of LDCs, does not appear prone to disaster in the Emergency Events Data base, but has a high agricultural production instability, due to recurrent droughts.

[19] We used this indicator in several previous works (cf for instance Guillaumont P. and S. 1988, Guillaumont, Guillaumont, Plane 1988, Guillaumont, Guillaumont Jeanneney and Brun 1999).

[20] The importance of services is the reason why instability of goods and services exports is a preferable indicator of vulnerability than the coefficient of export concentration, which could often be considered as an index of the main structural source of export instability: indeed the coefficient of concentration is related only to the exports of goods and cannot be easily extended in order to cover goods *and* services.

policy itself, but we can suppose that the effect of policy on export volume is more seizable through its trend than through its fluctuations.

Moreover there may be some problems in the measurement of the volume and price indices of trade at the country level. As it is well known, estimations (for instance by UNCTAD) of the developing countries unit values of exports, of imports and terms of trade are only tentative. And in any case they only cover the export of goods and not the export of goods *and* services. However, instead of the traditional time series of the import purchasing power of exports, i.e. income terms of trade (export value deflated by the unit value of imports), it is always possible to measure the "real" value of exports (goods and services) that is to say the value of exports in current dollars deflated by an index of world export prices: this would give comparable series of the purchasing power of the exports of goods and services in an identical basket of goods internationally traded[21].

Long term trend in the terms of trade: is it a shock?

Let us assume that we can use statistics of the countries unit values of export and import (of goods) and measure reliable series of the terms of trade (for goods), which is not the case for all the countries. Can the terms of trade trend, adequately measured (cf. infra), be considered as a shock for the small countries which are price takers? Of course, the trend value is sometimes considered as a proxy for anticipations. But it is indeed a negative event, which is not really predictable before it occurs. It can, conversely, be said that the longer the period covered the more able the country is to reallocate its resources so that the structure of trade will be more favourable. Thus depending on those considerations and on the purpose of the analysis of vulnerability, the terms of trade trend is or is not to be included among the components of economic vulnerability.

Other possible shocks: the capital account side

Above, we only considered the external trade shocks. Of course, other kinds of external shocks may occur, mainly due to short-term capital flows, as often experienced by Asian countries and Latin American countries as well. But regarding the low-income countries, and

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[21] It is the measurement made by the the CDP in the process of LDCs identification.

more specially commodity dependent economies, we limit our attention to trade shocks. And, as noted above, trade shocks in low-income countries are more structural, less induced, for instance, by policy variables than the fluctuations in the short-term capital flows, which are themselves more significant in the emerging economies[22].

2.4 - Dealing with instability measurement

The use of instability indices as components of a vulnerability indicator raises measurement problems, which are briefly indicated below. Instability is always relative to a reference or trend value. It will be measured, for instance, by the average absolute deviation from a trend, or more often, by the variance of this deviation[23]. The main choice is then estimation of the reference or trend value.

Looking for indicators of vulnerability comparable at the international level, we do not need to interpret instability as a risk variable perceived by economic agents, which would involve the specification of a model for forming expectations, possibly differing among countries. Moreover, as it will appear, instability is not damaging only because it engenders risk, but also through the asymmetric reactions to the ups and downs it induces. Thus it is simply needed to measure deviations from a trend observed in the past. But, as it is well known in the literature on instability or volatility, the question is how to measure the trend.

For instance, in the literature on export instability, a deterministic trend has long been assumed, that is, series X, a function of time t, is adjusted according to a model that is assumed to be either linear or exponential (for instance with the better fit of the two being then retained). In other words, $X_t = a\,t + c$ (with X_t possibly in log). But the possibility of nonstationarity of the series is to be taken into account. This means that the series do not correspond to a prespecified law [$X_t = f(t)$], but may be influenced permanently by shocks affecting the series, which may lead to a purely stochastic series or to a random-walk process

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[22] They are also more structural than the instability of aid flows, which may be a matter of concern in low income countries, but are themselves strongly influenced by the policy (or the politics) of recipient countries, or may reflect a compensatory purpose.

[23] When the series are related to values which on average strongly differ from one country to another and are not expressed in log, the deviations are preferably expressed in per cent of the trend value.

$[X_t = X_{t-1} + \varepsilon]$[24]. On the other hand, the series may not be purely stochastic. Thus it is possible to estimate a «mixed» function, combining a deterministic element and a stochastic element: $\text{Log } X_t = a' t + b \log X_{t-1} + c'$ (again with X_t possibly in log). The variance of the residual can then be a convenient measure of instability.[25]

Calculations made on very large sample of countries, show that the correlation between the two measures (deterministic and mixed) may be rather high. For instance, for the exports of goods and services in real terms (WDI data) on several periods (1970-1980, 1980-1990,1975-1985, 1985-1995), the rank correlation coefficient between the two instability indices stands between 0.87 and 0.93.

2.5 - Taking exposure into account

Adding indicators of exposure (not policy induced)

In a composite indicator of economic vulnerability, the exposure to shocks can be taken into account through one or several supplementary component indicators. For instance, it is conceivable to add to the preceding two indices, reflecting shocks, a third one, reflecting exposure, which would be the size of the population (expressed in logarithm), relying on the simple idea, that ceteris paribus, countries are the more vulnerable the smaller they are. The CDP has actually proposed to include among the components of its economic vulnerability index the size (log) of the population.

As noted above, the population size is a better indicator of structural exposure to trade shocks than the export to GDP ratio, since the latter depends not only on structural factors such as the population size, but also on policy factors[26]. Another more comprehensive way to capture the structural components of exposure to external shocks would be to use a value of the export to GDP ratio estimated (on a cross-section basis) as a function of only structural factors, such as population size, the initial level of GDP per capita, the export of mineral resources, etc. Actually the exports to GDP ratio can be broken down into two components: a

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[24] With X_t in log, it follows that the residual is the (annual) rate of change and the instability is measured by the variance of the (annual) rates of change.

[25] There are also more sophisticated measures.

[26] The export to GDP ratio has however been used in several attempts to measure economic vulnerability (cf. for instance Briguglio 1995, 1997, Crowards 1999, Atkins and alii 1998, Easter 1999).

structural one, which we just referred to, and a policy component, the latter being considered as an indicator of outward looking policy (Guillaumont P. and S. 1988, Guillaumont, 1989, 1994).

Weighting shock indicators by exposure indicators

But it is also conceivable to use exposure indicators as a multiplicative factor of shocks indicators. In other words, the indication of the size of the shocks could be weighted by an indicator of the exposure to the shocks. For instance, the indicator of export instability –or that of terms of trade instability- would be weighted by the average export to GDP ratio: such a weighted index of export instability has been presented as a significant negative factor of growth in several previous studies (Guillaumont and Deméocq 1989, Guillaumont 1994, Guillaumont, Guillaumont Jeanneney, Brun 1999)[27]. But if only structural vulnerability is to be measured, the weight to be used should not be the export to GDP ratio, for the reason previously indicated. It might be an indicator of the structural factors of exposure, such as (low) population size, or better, an adjusted value of the export to GDP ratio, estimated as a function of only structural variables (the corresponding residual is an indicator of a more or less outward-looking policy, cf. supra 2.2).

By the same way, it should be conceivable to weigh the index of instability of the agricultural production by the agricultural value added to GDP ratio: but again this ratio partly depends on policy factors. Moreover the exposure to shocks reflected by the agricultural production instability is not limited to the agricultural sector, which is an argument not to weigh the instability of agricultural production[28].

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[27] In a paper on the effects of export instability Dawe (1996) retains the instability of the export to GDP ratio itself, which is another way by which the exposure can be taken into account. But paradoxically, with regard to vulnerability, this instability measure is higher when the export fluctuations do no result in proportionnate GDP fluctuations (i.e. is not passed through to the whole economy).

[28] With regard to the risk of social conflict, let us recall that D. Rodrik (1999) takes as an indicator of exposure an index of latent social conflict and uses it as a multiplicative factor of the shock index (and of the indicator of the capacity to manage conflicts as well). Note that the index of shocks used by Rodrik is itself an index of terms of trade instability multiplied by the export to GDP ratio, thus to some extent incorporates a major component of "exposure".

2.6 - Weighting the components: some composite indicators recently proposed

The component indicators of economic vulnerability - the exposure components being either taken distinctly besides the shocks components or as weights of the latters - have to be aggregated in a composite indicator.

Equal weights

The simplest way to aggregate is of course, after measuring each component on the same scale depending on the maximum and minimum values[29], to calculate an unweighted average of these components. There is apparently no subjective choice of a weight, but since the actual weight is given by the number of components, a possible subjectivity may result from the choice of the components themselves.

Let us consider the economic vulnerability indicator (EVI) proposed by the CDP (United Nations, 2000). It is an unweighted average of five component indices:
- the instability of exports of goods and services
- the instability of agricultural production
- the log of the population size (small population size means higher exposure)
- the concentration of exports of goods (considered as a factor of instability of exports, but which does not cover the exports of services[30])
- the share of manufacturing and modern services in GDP (here taken as another proxy for (less) exposure).

The first three indices reflect, respectively, the two main kinds of shocks and the main factor governing exposure. As such they present a simple and consistent selection of components of a vulnerability indicator. The last two elements (export concentration and share of manufacturing), drawn from the components of the previous "economic diversification index" (EDI), which until now the CDP used instead of the new proposed EVI as one of the criteria for LDCs identification, are intended to show the continuity between the two indices. At the same time, since export concentration is a factor of higher export

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[29] It is sometimes proposed, but debated, to limit the scale at the highest and the lowest decile values (cf. for instance Crowards 1999, United Nations, 2000).

[30] It is a Gini-Hirschman export concentration index, as regularly calculated by UNCTAD.

instability, it apparently leads to give more weight to trade shocks than to natural shocks. But export instability may itself partly reflect natural shocks. On the whole the two main kinds of shocks may be considered to be given a similar weight. Regarding the share of manufacturing, it is, for a given GDP per capita, closely linked to the size of the population: introduced simultaneously, the population size and share of manufacturing indices lead to give 40 per cent of the total weight to the exposure components of vulnerability.

Revealed weights

In a recent work (Guillaumont and Chauvet 1999), we have used a set of component indicators to build a composite indicator of vulnerability, with the weights not chosen a priori, but drawn from an econometric exercise 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 components retained are the respective instabilities of real exports (goods and services) and of agricultural production, of population size and also (for the need of the study) the trend in the terms of trade. These four factors appear to be significant, besides some common control variables, in a growth regression, pooling two eleven-year periods and covering 95 observations. The resulting vulnerability indicator can be seen as the *ceteris paribus* impact of the exogenous shocks and exposure to them on economic growth. Another way to weigh the components would be to estimate their impact on poverty change, but comparable statistics of poverty reduction are not available on a larger sample of countries.

Alternative approach: growth volatility

Another example of an econometric weighting is given by the Commonwealth Secretariat index of vulnerability (several versions have been presented including Atkins and Mazzi 1998, Easter 1999). It is an estimated value of instability of the rate of growth, with three explanatory variables empirically chosen among a lot (more than fifty), which reflect policy factors as well as structural factors.[31] The three retained factors are the index of natural

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[31] The index is itself multiplied by an index of the GDP per capita, considered as a proxy of resilience, to give a "composite vulnerability index".

disasters[32], the so-called UNCTAD index of export diversification[33] and the ratio of exports of goods and services to GDP. One main problem with this indicator is that it measures vulnerability with regard to growth volatility, which is less relevant than the average growth itself. Moreover the last of the three factors (export to GDP ratio) is partly policy induced, and as such inappropriate to measure structural vulnerability.

Other works have shown how GDP growth volatility depends on policy factors. For instance, Easterly, Islam and Stiglitz (2000) have stressed the negative effect (up to a point) of financial depth and the positive effect of openness. More specifically, concerning the effects of openness, the opposite effects of the structural factors of trade openness (i.e. of structural vulnerability), and of the openness of policy (the outward looking orientation of policy) on the volatility of the rate of GDP growth has also been evidenced (Combes, Guillaumont, Guillaumont Jeanneney and Combes Motel, 2000): structural vulnerability makes growth more unstable, whereas outward looking policy makes it more stable.

Briefly stated, growth rate volatility is not as such a good synthetic indicator of structural vulnerability since it depends on policy factors as well as structural ones. And the alternative method which would be to consider an estimated value of growth volatility using as regressions only structural factors is not preferable to the estimation of the impact on the aggregate rate of growth of the structural vulnerability components: vulnerability has been designed as a vulnerability to growth, and for development the average growth rate matters more than its volatility.

3 - THE IMPACT OF VULNERABILITY ON GROWTH: SELECTED ISSUES IN BRIEF

Since vulnerability has been defined with regard to growth (as a growth or development handicap) it is useful to clarify the ways by which it is expected to do so. We here present some propositions, which are likely to enlighten the link between vulnerability and growth and have been considered in some recent cross-sectional works.

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[32] An index taken into account, through a dummy variable, only for the countries with a "small" population size (see above 2.3 a short discussion of this indicator).
[33] Differing from the export concentration index, this index is the absolute deviation of the (each commodity) country share from the world structure. As noted by UNCTAD it is hardly used to discriminate between low income countries.

3.1 - Primary instabilities as a negative factor of growth

Let us first consider the effect on growth of the instabilities assumed to be exogenous, as tested by several recent papers assessing the effects of shock size, exposure and some times resilience. Following the comparative approach adopted in the previous part of the paper, we mainly consider the effects empirically identified through cross-sectional analyses. An important literature also examines the effects of trade shocks under their theoretical aspects and through country case studies (cf. Collier and Gunning 1999).

For many years the effects of export instability on the growth of developing countries have been discussed in the literature using growth regressions. The results could appear as mixed, partly due to methodological shortcomings. A recent survey shows an emerging consensus among studies to conclude that export instability has a negative effect on growth [34]. For instance, Dawe (1996) and Guillaumont (1994) have shown a significant negative effect of export instability on growth. Both studies test simultaneously the (positive) effect of export growth, and the (negative) effect of export instability. As noted above, the export instability (size of the shocks) is in both cases either weighted by the average export to GDP ratio during the period (Guillaumont 1994) or is an instability of the export to GDP ratio itself (Dawe 1996)[35].

A recent paper estimates the influence of several kinds of "primary", mostly exogenous, instabilities on the rate of growth and argues that these instabilities may have been a major factor of the slow rate of growth in sub-Saharan Africa during the seventies and eighties, since these instabilities appear to have been significantly higher in Africa South of the Sahara than in other developing countries (Guillaumont, Guillaumont Jeanneney and Brun 1999). The primary 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, weighted in the same way, the instability of the agricultural value added (weighted by the average share of agricultural value added in GDP) and an index of political instability. To be noted, the first and the third instabilities appear to have a significant effect on growth, but not that of the agricultural value added.

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[34] cf C. Araujo Bonjean, J.L. Combes, P. Combes Motel, 1999. See also CERDI, 1997, reviewed studies include Glezakos 1984, Guillaumont and Deméocq 1989, Gyimah-Brempong 1991, Fosu 1992, Guillaumont 1994, Lutz 1994, Dawe 1996.

[35] cf supra footnote 26, p. 14.

In another work both the instabilities of real value of exports and of agricultural value added, here unweighted, appear to be significant, besides the log of population, as a proxy for exposure (Guillaumont and Chauvet 1999): these results, as indicated above, allow us to use these instabilities as components of a composite vulnerability indicator, weighted by the coefficients of the regression.

The previous tests consider separately the main sources of instability or vulnerability. A comprehensive test of the possible impact of instability, which appears to be simultaneously a test of vulnerability, is that of Ramey and Ramey (1995): they showed a significant link between the instability of the rate of economic growth and the average rate of growth itself. The exogeneity of the instability of the rate of growth is tested, but this instability can be due to structural factors and to policy factors as well.

Also not trying to separate structural from policy sources of vulnerability, Rodrik (1998) tests significantly the negative influence on the change in the rate of growth between two fifteen-year periods of a multiplicative index of "conflict", which multiplies an index of "shocks" by an index of "latent social conflict" (the ethnolinguistic fragmentation index or a Gini coefficient of income inequality), then by an index of the quality of conflict management institutions (namely the lack of democracy or the quality of governmental institutions as measured by Knack and Keefer, 1995). Each of these, introduced alternatively, appears highly significant. Rodrik also tests the respective effects of trade "shocks" and of either an exposure index or a capacity to manage index.

3.2 – Vulnerability channelled through factor productivity or through the rate of investment

Growth regressions on instability or vulnerability indicators either include or exclude the rate of investment besides the other control variables. When the rate of investment (investment to GDP ratio) is included, the coefficient of the instability or vulnerability indices only expresses their impact on the growth residual, whereas when it is excluded, the coefficient is assumed to assess their total effect, both through the rate of investment and the growth of factor productivity.

It has been argued that risk (proxied by instability measures) may be a lowering factor of investment (see for instance Aizenman and Marion 1999). However, in the previously quoted cross-section growth regressions, the instabilities, either the so-called primary instabilities (Guillaumont, Guillaumont Jeanneney, Brun 1999) or that of rate of growth (Ramey and Ramey 1995), essentially lessen the rate of growth of total factor productivity. Actually the weighted instability of the terms of trade appears to increase rather than lower the rate of investment (Guillaumont, Guillaumont Jeanneney, Brun 1999), which makes the effect on the growth residual alone stronger than the total effect on growth. Similar results about the effects of (weighted) export instabilities were found by Guillaumont (1994) and Dawe (1996), who underline the effects through the growth residual rather than through the rate of investment[36]

3.3 – Structural vulnerability passed through to economic policy

If economic vulnerability is mainly due to an effect on the growth residual, the way by which it does so needs to be explained.

Two main intermediate instabilities: rate of investment and real exchange rate

Guillaumont, Guillaumont Jeanneney, Brun 1999, tested the hypothesis that the primary instabilities (terms of trade, agricultural production, political instability) influence growth through two important intermediate instabilities, namely the instability of the rate of investment and that of the relative prices. These two intermediate instabilities have negative effects on growth and are related to policy.

First, the instability of the rate of investment is a factor, curiously neglected in the literature, of a lower average productivity. As a result of the declining marginal productivity of investment, the gain in total output due to a high level of investment is less than the loss due to a low level of investment. This effect, illustrated during the boom periods by the projects oversized, underprepared and weakly productive, mainly concerns public investment.

Second, intermediate instability, that of the relative prices, proxied by the instability of the real effective exchange rate (REER) also appear to have a strong negative effect on the

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[36] Arguments about a positive effect of export instability on savings and investment have been presented in the

rate of growth. It is assumed to blur the market signals and induce a misallocation of investment. This negative effect of the REER instability or volatility has also been evidenced in several recent papers (cf. for instance Aizenman and Marion 1999, Ghura and Grennes 1993, Serven 1997). It appears to have not only an effect on the total factor productivity, but also a negative effect on the rate of investment (Guillaumont, Guillaumont Jeanneney and Brun, 1999).

Instability at the farmer level

Either due to the macro policy through REER instability or to the passing through to farmers of world agricultural prices fluctuations, the instability of the real producer prices is generally considered as a factor of a lower average agricultural output (as well as a factor of lower welfare), noticeably by its effects on the adoption of new techniques (Newbery and Stiglitz 1981). Time-series studies are related to some specific products and countries (for instance Behrman 1968, Just 1974, Lim 1977, Guillaumont and Bonjean 1991, Araujo 1995). Others have significantly tested the effects of the real producer prices instability on the growth of agricultural production from a sample pooling several products in many countries (Guillaumont and Combes 1996, Guillaumont and Guillaumont 1994, Boussard and Gérard 1996). Thus it appears that external instability has negative effects through the instability of the rate of investment and of the real exchange rate either by its impact on public finance when retained at the government level or by its impact at the producer level when passed through.

Instability, policy and performance

The hypothesis that economic vulnerability is linked to government behavior is supported by the inclusion of a vulnerability indicator in a model where the explained variable is a composite indicator of macro policy. Let us consider an indicator of macro policy similar to that used by Burnside and Dollar (1997), including as components the ratio of budget surplus to GDP, the rate of inflation, and the Sachs and Warner measure of openness, weighted by their impact on growth in a cross-section model with other common control variables (it is a measure of the impact on growth of these three identified factors, *ceteris*

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literature for a long time (Knudsen and Yotopoulos 1976, Lim 1980) and debated in various papers as well.

paribus). This indicator of policy appears itself to be significantly and negatively influenced by the level of economic vulnerability, as measured by the index presented above (Guillaumont and Chauvet 1999)[37]. This means that structural vulnerability weakens policy.

This influence of exogenous instabilities on the quality of economic policy has some implications on the measurement of country performances. Performance can be defined as outcomes (for instance growth outcomes) adjusted for the impact of exogenous factors (Collier, Guillaumont, Guillaumont Jeanneney, Gunning, 1997). If exogenous factors, such as external instabilities, have an impact on policy, this impact has to be taken into account in the measurement of performances: outcomes have to be adjusted not only for the direct impact of exogenous factors (including many instabilities), but also for their impact on policy (Guillaumont and Chauvet, 1999). In other words, performance has to be assessed once taken into account the impact of structural vulnerability, including its impact on policy.

3.4 – Structural vulnerability effects dampened by policy

Structural vulnerability not only has an impact on the quality of economic policy (i.e. the policy indicators); its effects (on growth) may also depend on policy. Policy and institutions are the main factors of the resilience with regard to shocks. This is precisely the reason why structural vulnerability has to be distinguished from overall vulnerability, which includes an autonomous policy component (essentially through the resilience).

A test of this conditional effect of structural vulnerability is given in a paper (Guillaumont 1994) where the effect on economic growth of the (weighted) export instability appears to depend on the more or less outward looking character of policy. This character is proxied by the residual of a function of the export to GDP ratio, where the explanatory variables are only structural ones (population size, initial level of GDP per capita, export of minerals, landlookedness). It appears that, in the growth regression, the absolute value of the (negative) coefficient of the (weighted) export instability is the smaller the more outward looking is the policy. Thus three effects of a more open trade policy are identified and significantly tested: the well known positive effect of the growth of exports, the negative effect of the increase of the exposure to instability (the export to GDP ratio weighting the

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[37] Another significant explanatory variable is the level of initial human capital (average years of schooling).

export instability), and the positive effect of lessening the impact of a given (weighted) export instability, which means a greater resilience.

3.5 – Structural vulnerability effects also dampened by aid

Impact of structural vulnerability on aid effectiveness

It has been argued (Burnside and Dollar 1997) that aid effectiveness strongly depends on policy. When policy is good, aid is efficient in promoting growth. When policy is bad, aid is not efficient, or is counterproductive. Aid is simultaneously supposed to have no effect on policy. In a further step, assuming that the marginal effect of aid on growth is decreasing, and that there is a simple relation between growth and poverty reduction, it has been suggested how aid should be allocated so as to maximize its effects on poverty reduction (Collier and Dollar 1999)[38].

But it can also be argued that aid effectiveness depends on structural vulnerability. The more vulnerable the recipient country, the higher is the marginal contribution of aid to growth: in vulnerable countries aid helps to avoid collapses and lasting recessions (Guillaumont and Chauvet 1999). This alternative assumption, tested on a cross sectional growth regression over 1970-1993 divided into two eleven-year pooled periods, with a large sample of developing countries and the traditional control variables, is not rejected by conventional econometric tests.

The same model rejects the assumption of an aid effectiveness dependent on policy. The results have been obtained with TSLS, where aid and policy variables (the same that the Burnside and Dollar policy variables) are instrumented. The test variable is a multiplicative variable (Aid x Vulnerability) introduced successively besides and instead of the multiplicative variable of Burnside and Dollar (Aid x Policy). Structural vulnerability lowers growth, but is likely to increase aid effectiveness. Macro-policy factors enhance growth, but do not seem to clearly influence aid effectiveness.[39]

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[38] The various assumptions of these studies have been reviewed in Guillaumont 1999.
[39] The criticism of the Burnside and Dollar findings can be found in Fin and Tarp (2000) and in Lensink and White (2000)

Implications for aid allocation

An implication of the previous argument is that structural vulnerability of the recipient countries has to be taken into account, not only for its direct negative impact on growth (and poverty), but also with regard to aid effectiveness, in order to maximize through its allocation the effect of aid on growth, and consequently on poverty reduction. At least partly, aid has to be allocated according to the vulnerability of the country, not only to compensate for a loss of welfare, but also to maximize its effects on growth, because aid is more efficient in vulnerable countries. By this way it can contribute more to poverty reduction, because the latter mainly depends on the rate of growth.

However, in order to also give incentives for policy improvements, it is possible to design aid allocation criteria likely to combine the creation of such incentives and the increase of aid effectiveness as a function of vulnerability (cf. Guillaumont and Chauvet 1999). It is to allocate aid according to performances of the countries, as defined above (outcomes, growth or poverty reduction, adjusted for the impact of the exogenous or environmental factor, i.e. factors not induced by policy, firstly structural vulnerability factors). This proposal (in line with a previous paper by Collier, Guillaumont, Guillaumont Jeanneney, Gunning 1999) is likely both to increase aid effectiveness (since, for a given outcome, performance is better when vulnerability is high) and to promote good policy (a good policy leads to a better outcome, for a given vulnerability). The political advantage of this approach, compared to an allocation only based on policy criteria, is not only to take into account vulnerability, but also to leave the country free to choose the policy instruments by which it tries to obtain better outcomes.

It can be noted here that the choice made by the CDP of an economic vulnerability indicator as one of the main criteria of identification of LDCs, a category of country expected to mobilize a relatively larger amount of aid than other developing countries, is consistent with the argument of a higher aid effectiveness in vulnerable countries.

Implications for aid design

The consequences of vulnerability have a second set of implications for aid design. Aid could be designed precisely to lessen vulnerability. We remember that vulnerability has

three components: shock, exposure and resilience. As far as the shocks size and countries exposure are structural, the priority to lessen vulnerability is to lower the countries resilience. Indeed the most efficient way by which aid can contribute to the lessening of vulnerability, and the fastest, is to enhance the capacity of the countries to manage the shocks they face, and at the micro level, the capacity of the farmers to cope with the shocks transmitted to them or occurring at their level. In other words, aid should be targeted to build or enhance "insurance" schemes at the macro and the micro level.

Some kinds of aid are explicitly devoted to face vulnerability problems such as the IMF Compensatory and Contingency Financing Facility and the European Union former STABEX and SYSMIN. To illustrate the implications of vulnerability for aid design, we specially refer here to STABEX, because it was designed primarily to help poor farmers to face the consequences of their export crops volume or price instability. In other words, it was intended to address the problems of vulnerability at the micro level as much as at the macro level.

Initially STABEX offered an automatic compensation for shortfalls occurring in ACP countries exports of a limited list of agricultural products, considered independently from each other. During the successive Lome Conventions, an increasing control has been put on the use of the funds, with consequently more lags and less automaticity. In two recent papers (Collier, Guillaumont, Guillaumont Jeanneney, Gunning 1998, 1999)[40], the rationale and the modalities of a reform of STABEX have been considered, in view of the new agreement then negotiated between ACP and EU countries. The issue was to conciliate the two initial principles of STABEX, automaticity (for quick disbursements) and agricultural income support and smoothing, which have not been satisfied during the past years due to increasing disbursements lags, fongibility and possible "dutch disease" effects.

The proposed solutions were to set up in advance an agreement between the ACP States and the European Union about the rules of a quick use of resources, relying on (price or crops) insurance or on new fashioned, i.e. more market based price stabilization schemes. In case of shortfalls, funds would be automatically available to support these insurance or stabilization schemes, allowing them to work at a minimum cost for the farmers. The authors

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[40] Relying themselves on a larger study done for the European Commission

argue that in such insurance schemes the self-selection of beneficiaries would not be adverse but beneficial and that moral hazard could be controlled. They also indicate in which conditions (market-based) stabilization schemes could work efficiently with an external support: by conditioning the external support to the location of surpluses outside the State budget or outside the country, to maintaining a link between the producer prices and the trend of the world market prices and, when the State is involved in the scheme, to the limitation of the crop taxation during the boom period.

The new agreement between EU and ACP States no longer refers to STABEX (neither to SYSMIN), but does include a "support in case of short-term fluctuations in export earnings" (chapter 3, art. 68), the purpose of which is "to safeguard macro-economic and sectoral reforms and policies that are at risk as a result of a drop in revenue and remedy the adverse effects of instability of export earnings in particular from agricultural and mining products". As far as this part of the new agreement can be implemented by several ways, the STABEX reform proposals indicated above are still relevant in the new framework of EU/ACP relationships.

In other words, there is large room for an external support to various kinds of schemes helping poor farmers to cope with the risks they face, and at the same time giving to governments incentives to a better management of the instability. As is well known however, the bad management of the booms has created the bulk of the difficulties encountered in shortfall periods.

Conclusions

Vulnerability matters, no doubt. But to be used efficiently as a conceptual tool in international co-operation, economic vulnerability has to be considered distinctly from ecological fragility, and economic structural vulnerability distinctly from (mainly policy based) resilience. Differing from structural economic vulnerability, the global economic vulnerability also includes autonomous policy elements, which influence less the size of shocks and the exposure to these shocks than the capacity to manage them, the "resilience". We have argued here that it is possible to build an internationally comparable indicator of structural economic vulnerability of low-income countries (i) relying on the two main kinds of shocks they face, natural shocks and trade shocks, proxied by the respective instabilities of

real exports and of agricultural production, (ii) including in one way or another a consideration of the (not policy induced) exposure to these shocks, primarily through the size of the population, (iii) weighting the basic component indices, either equally or by their respective impact on growth.

Relying on cross-sectional studies, several propositions can enlighten how structural vulnerability is a matter of concern for growth, development and co-operation policies:

1 – "Primary" instabilities (export, terms of trade, rainfall, …), depending on the country exposure to these shocks, lower growth. In particular it appears that economic growth, while enhanced by the average growth of export earnings (terms of trade), is lowered by their instability, (with both the growth and the instability of exports weighted by the exports to GDP ratio, reflecting the exposure): the same holds for the effects of the growth and of the instability of terms of trade.

2 – The effects of structural vulnerability (the weighted instabilities) seem to lower the total factor productivity growth rather than the rate of investment.

3 – The effects of structural vulnerability (the previous instabilities) are to a large extent passed through economic policy variables, mainly "intermediate" instabilities (of the rate of investment of the real exchange rate) and also of the agricultural producer prices.

4 – The effects of structural vulnerability can be dampened by an outward-looking economic policy: such a policy, of course, increases the exposure, but improves the resilience.

5 – They also can be dampened by foreign aid. This means that foreign aid efficiency is *ceteris paribus* higher in the more vulnerable countries. It is a justification to consider structural vulnerability among the criteria used for identification of least developed countries, as recently proposed by the Committee for Development Policy.

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