Updating and augmenting the economic vulnerability index[1]

Introduction

The economic vulnerability index (EVI) was initially developed by Briguglio (1992, 1993, 1995) to explain the seeming contradiction that a country can be economically vulnerable and yet register a relatively high GDP per capita. Many versions of the index were produced following Briguglio's work, including Chander (1996), Wells (1997), Atkins et al. (1998, 2001) and Crowards (1999). The general conclusion that emerged from these studies is that small island developing states tend to be more economically vulnerable than other groups of countries.

The characteristics of small island developing states (SIDS) are well documented (see for example, Briguglio, 1995), and include limited ability to exploit economies of scale; lack of natural resource endowments and a high import content (especially of strategic imports such as food and fuel). Other characteristics relate to limitations of production diversification possibilities; dependence on a narrow range of exports; limitations on the extent to which domestic competition policy can be applied; inability to influence international prices; and, in the case of island states, high international transport costs and uncertainties of industrial supplies due to insularity and remoteness.

Small size also creates problems associated with public administration, the most important of which is probably the small manpower resource base from which to draw experienced and efficient administrators. Another problem is that many government functions tend to be very expensive per capita when the population is small, due to the fact that certain expenses are not divisible in proportion to the number of users.

Definition of vulnerability

For the purpose of this paper, the term 'economic vulnerability' refers to inherent, permanent or quasi-permanent features of a country which render that country exposed to economic forces outside its control.

It should be noted here that economic vulnerability can also be policy-induced and therefore not inherent or permanent. For the purpose of this paper, policy-induced vulnerability is being treated as the obverse of 'resilience' in the sense that countries adopting policies which exacerbate their inherent vulnerability, render themselves less resilient.

What constitutes economic vulnerability?

The principal variables which are used in this study to construct an EVI are (a) economic openness, (b) export concentration, (c) dependence on strategic imports, and (d) peripherality.

Economic openness

Economic openness relates to the degree to which a country is susceptible to economic conditions in the rest of the world. It is often measured as the ratio of exports or imports, or an average of both, to GDP. In the computation which follows, the openness index uses the average of imports and exports.

Dependence on a narrow range of exports

The range of exports captures the extent to which a country lacks export diversification, a condition exacerbating the degree of economic openness. This is usually measured by the export concentration index devised by UNCTAD, which only covers merchandise. Briguglio (1997) argued that export concentration can also be observed in the trade in services, especially in tourism and financial services, and, for this purpose, he devised a concentration index with services exports included. In the computation that follows, the concentration index covers both goods and services.

Dependence on strategic imports

This variable is intended to measure the extent to which a country's economy depends on imports. There are obvious vulnerability connotations when a country depends heavily on imported energy and industrial supplies for production and on imported food for consumption. Various indices have been used for this purpose. Several indices have been proposed to measure dependence on strategic imports. Galea (2003) suggested that this variable can be measured as ratio of food imports to GDP. This index is used in the computation of the Vulnerability Index presented below.

Peripherality

Peripherality is associated with insularity and remoteness, leading to high transport costs and marginalisation from main commercial centres. This again exacerbates the problem of high dependence on international trade. The problem with the peripherality variable is that it cannot be measured directly by taking the number of kilometres from a main commercial centre, or from the nearest island or from the nearest continent. In the case of certain islands, a relatively large proportion of international trade is directed to and from their former colonial masters, even though other centres of commercial activity could be more proximate. In other words, measuring remoteness by taking distance in kilometres may convey the wrong sort of information regarding insularity and remoteness, for economic purposes. Two variables which may reflect the effects of remoteness are (1) the ratio of Free on Board/Cost Insurance and Freight (FOB/CIF) factors and (2) the ratio of transport and freight costs to imports. In the computation that follows, the second ratio was used, since it has been considered to be more meaningful.

Updated computation of the vulnerability index

Below, we present an updated computation of the EVI, building on Briguglio (1995) and Briguglio (1997)[2]. The procedure involves three main steps, as follows:

i measuring the individual components of the index
ii standardising the values
iii averaging the three components

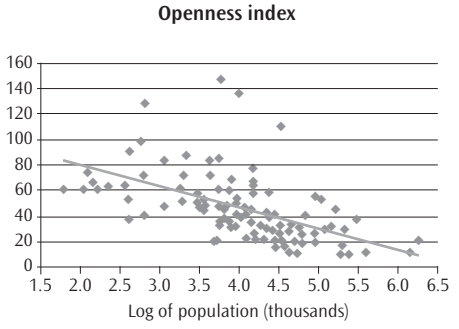
Measuring the individual components of the index

The first step in constructing the vulnerability index is to obtain the values of the components of the index. The results confirm that SIDS, when compared to other groups of countries, tend to:

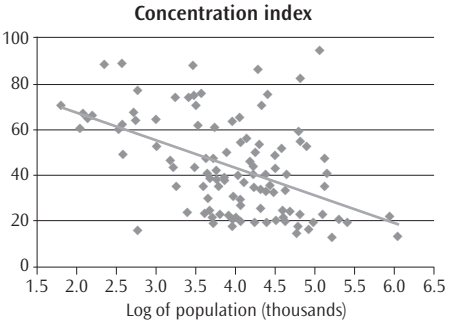
- be more exposed to international trade,
- have higher export concentration indices,
- are more dependent on strategic imports, and
- have relatively higher unit transport costs in international trade than other groups of countries.

These tendencies are shown in Figure 2.1. The diagrams show the relationships between the variables just described and population size, measured in logs[3].

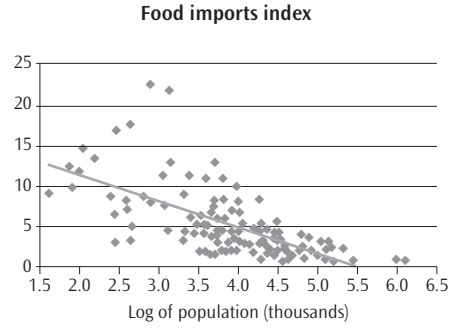
Figure 2.1. Population size and economic vulnerability features



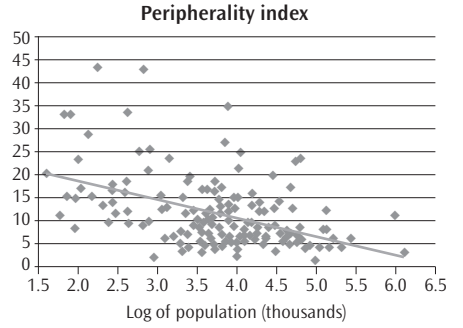
The openness index is measured as follows: Exports plus imports of goods and services/(2*GDP): Sources: UNCTAD *Handbook of Statistics* (2001), IMF *Balance of Payments Statistics Yearbook* (2002). Data pertains to 1998–1999.



The concentration index is measured as follows: The three major groups of exports of goods and services as a percentage of total exports of goods and services: Sources: UNCTAD *Handbook of Statistics* (2001), IMF *Balance of Payments Statistics Yearbook* (2002) and calculations by the authors). Data pertains to 1998–1999.



The food imports Index is measured as follows: Food imports as a percentage of GDP. Data pertains to 1998–1999. Sources: UNCTAD *Handbook of Statistics* (2001) and IMF *Balance of Payments Statistics Yearbook* (2002)



The peripherality index is measured as follows: The ratio of transport and freight costs to imports. Source: IMF's *Balance of Payments Statistics Yearbook* (2002). Data pertains to 1998–1999.

Standardising the values of the components

The summation of the variables making up the composite index poses problems. The approach taken by Briguglio is to standardise the observations, using the following formula:

$$XSij = (Xij - Min\ Xj) / (Max\ Xj - Min\ Xj)$$

Where:

XSij is that standardised value of Xij.
Xij is the ith observed value in an array of values of component j of the index.
Max Xj is the highest value in the same array.
Min Xj is the lowest value in the same array.

The procedure to calculate XSij is the following:

i Take an array of observed values for the first component of the index (i.e. j = 1).
ii Find the minimum and the maximum values of this array of observations.
iii Take an individual observation from this array and subtract from it the minimum value of the array. Repeat this for all observations.
iv Take the maximum value of this array and subtract from it the minimum value of the same array.
v Divide the result of (iii) by the result of (iv).
vi Repeat this procedure for the other components of the index.

The array of standardised values of each component, using the formula just described, will be between 0 and 1.

Weighting the components of the index

An important consideration in the construction of composite indices relates to the weight that is to be given to the individual components of the index. One approach is to use equal weighting, an approach which is often used, either because the components of the index are deemed to be of equal importance or because of lack of sound theoretical underpinnings, to justify variable weights. Variable weights can be used if there is sufficient reason to believe that some components have a stronger effect than others on the phenomenon that is being measured[4].

Constructing the vulnerability composite index

In order to calculate values on the composite index, the four variables just described were averaged out, using equal weights[5]. The results obtained are shown in Figure 2.2 based on the data shown in the Appendix to this chapter.

The results indicate that there is negative relationship between population size and economic vulnerability, as measured by the variables described above.

Table 2.1 shows the vulnerability scores classified by population size, where it is clear that smaller countries tend to have higher vulnerability scores than larger ones. This tendency is true for developed as well as for developing countries.

Figure 2.2. The economic vulnerability index (117 countries)

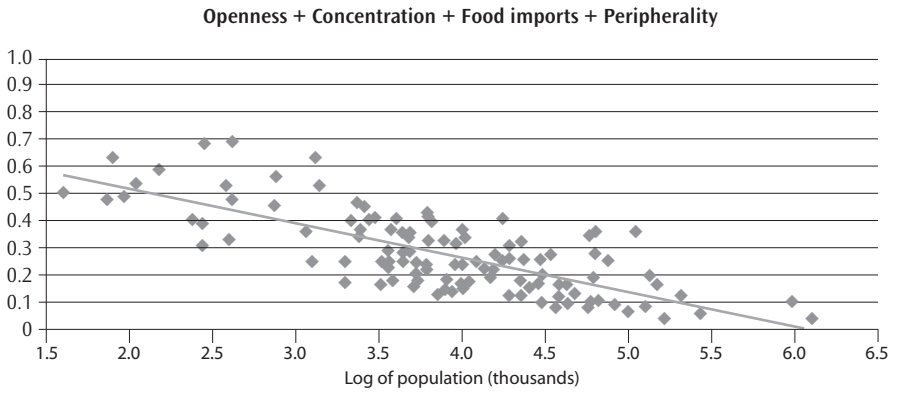


Table 2.1. Vulnerability score classified by population size

Population (millions)	Number of countries	Vulnerability score
0–1	17	.492
1–2	6	.359
2–5	21	.323
5–20	35	.237
20–50	17	.184
50–100	11	.182
100–200	6	.177
200+	4	.089
Total	**117**	

Table 2.2 shows the vulnerability scores, classified by category of countries. It can be seen that SIDS register the highest vulnerability scores. Other small developing states (OSDS) also register high scores. Large developing states (LDS), on the other hand, register relatively low vulnerability scores. The lowest scores are registered by large advanced states (LAS). Of particular interest is that small advanced states (SAS) also register higher scores than LDS.

Table 2.2. Vulnerability scores classified by Different Categories of Countries

Category	Number of countries	Vulnerability score
SIDS	19	.470
OSDS	20	.354
LDS	56	.220
SAS	5	.258
LAS	17	.148
Total	**117**	

Economic resilience

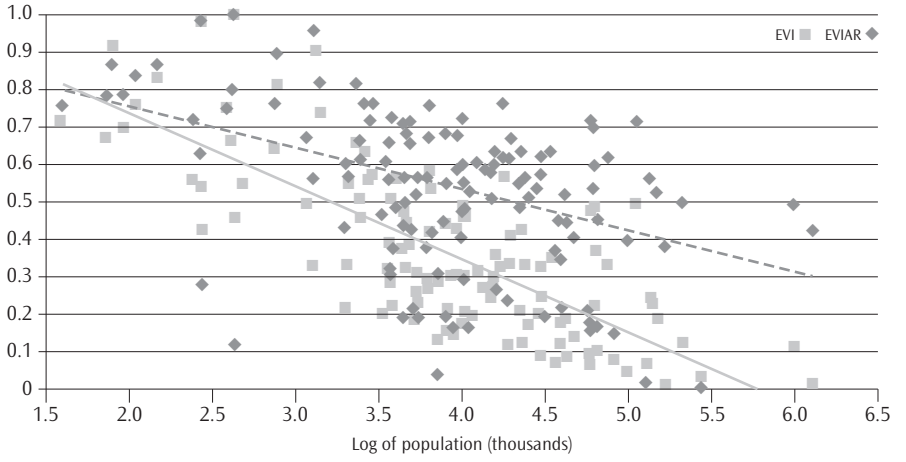
It would be useful to assess the degree to which economically vulnerable countries, as a group or individually, are coping with or withstanding their economic vulnerability. Such a measurement could especially be useful for small states to identify their weak points with regard to resilience-building and serve as a monitoring tool in this regard.

Such a resilience index does not exist[6], and in its absence, we propose that a proxy indicator could be GDP per capita. This variable may capture a country's ex-post material success or otherwise to cope with its inherent vulnerability[7].

Although we have not tested the relationship between the resilience factors outlined above and GDP per capita index, we are assuming that they are closely related. GDP per capita is an attractive index as it is readily available, and can be adjusted for purchasing power standards.

We have constructed an index which combines the EVI with the GDP per capita index, calling it EVIAR (Economic Vulnerability Index Augmented by Resilience). This result is shown graphically in Figure 2.3, which is based on the data given in Appendix 1.

Figure 2.3. The EVI and the EVIAR



The figure reproduces the EVI, so as to compare it with the EVIAR. It can be seen that the gradient of the EVIAR is lower than that of the EVI. This results from the fact that many vulnerable states have a relatively high GDP per capita.

For example, Singapore ranks 7th on the EVI, but because it has a high GDP per capita, it ranks 54th in the EVIAR out of 117 countries. Similarly, Malta ranks 5th on the EVI and 17th on the EVIAR. This is true of SIDS with a relatively high GDP per capita.

It should be noted here that vulnerability need not result in poverty. There are inherently vulnerable small states which have adopted policies to withstand their vulnerability. This suggests that vulnerable states should not accept their condition as a fait accompli as it is possible to build up resilience to cope with inherent vulnerability.

The fact that some SIDS have strengthened their resilience to withstand vulnerability would seem to be paradoxical, as SIDS are likely to have very limited resources to build economic resilience. In reality, some SIDS may have been able to register relatively high GDP per capita in the past partly due to internal policies and partly due to a number of 'props' they enjoyed, including preferential trade arrangements, attractive incentive packages to attract FDI, and development assistance. However, contrary to some other states, these SIDS would seem to have used these 'props' well.

The findings in this paper suggests also that SIDS which currently register relatively low GDP per capita, and are therefore vulnerable and poor, merit special attention and support by the donor community, to enable them to strengthen their resilience in a sustainable manner.

Concluding considerations

A number of considerations emerge from the findings presented in this paper. First and foremost, the updated Economic Vulnerability Index produced above has confirmed the findings in Briguglio (1995) that SIDS, as a group, tend to be more economically vulnerable than other groups of countries.

The study also suggests that the fact that many SIDS register relatively high GDP per capita can be attributed to the possibility that these states are to an extent coping with their inherent vulnerability. This can possibly be due to the wise governance practices and sound economic management, as well as the props they enjoyed including preferential trade arrangements, attractive incentive packages to attract FDI, and development assistance from the former colonial masters.

A major implication of these considerations is that resilience-building should take centre stage in the sustainable development strategies of economically vulnerable economies, particularly SIDS with a low GNP per capita.

Notes

1 This chapter is reproduced from Briguglio and Galea (2003), with minor changes to render it compatible for inclusion in this volume.

2 Some words of caution are warranted regarding the choice of variables that compose the index. As in the case of studies that involve the construction of composite indices, the choice of the components of the index is somewhat subjective. However, care was taken to base the choice on a set of desirable criteria related to relevance, appropriate coverage, simplicity and ease of comprehension, affordability, suitability for international comparisons and transparency. A more detailed consideration of these criteria is given in Briguglio (2003).

3 The reason for measuring population in logs is to reduce the spread of values on the horizontal axis, given that country populations range from thousands to over a billion.

4 Methods often used to justify variable weights include participatory methods, where experts are asked to assign the degree of importance of the different components (see Moldan and Billharz, 1997) and the benefit-of-the-doubt weighting system Melyn and Moesen (1991), which involves using weights that yield the highest possible composite value. Aktins et al. (2000), drawing on the approach used by Wells (1997), use the regression method to let the data determine the weights – a procedure that requires the choice of a proxy variable to represent the phenomenon being measured.

5 However, some experimentation was carried out with varying weights, with a 40 per cent weight assigned to the openness index and 20 per cent to the other three indices, but the result did not change significantly.
6 This paper was written in 2003 when the resilience index proposed by Briguglio et al. (2006) had not yet been constructed.
7 This issue will be discussed in more detail in Chapter 3.

Appendix

The vulnerability index and GDP per capita

	Log of population	Vulnerability index standardised	GDP per capita standardised	EVIAR
St Kitts and Nevis	3.689	0.685	0.827	0.756
Dominica	4.295	0.588	0.920	0.754
Seychelles	4.382	1.000	0.837	0.919
Grenada	4.536	0.645	0.909	0.777
St Vincent & the Grenadines	4.700	0.647	0.934	0.790
St Lucia	5.011	0.765	0.901	0.833
Belize	5.494	0.588	0.937	0.762
Barbados	5.598	0.549	0.796	0.672
Maldives	5.611	0.948	0.956	0.952
Iceland	5.623	0.465	0.310	0.387
Malta	5.958	0.765	0.790	0.778
Suriname	6.024	0.724	0.963	0.844
Cape Verde	6.052	0.950	0.972	0.961
Luxembourg	6.072	0.471	0.000	0.235
Cyprus	6.625	0.643	0.917	0.780
Guyana	6.646	0.605	0.982	0.793
Mauritius	7.068	0.484	0.915	0.699
Trinidad & Tobago	7.147	0.408	0.893	0.651
The Gambia	7.182	0.708	0.995	0.851
Estonia	7.247	0.695	0.918	0.807
Slovenia	7.594	0.235	0.781	0.508
Macedonia, FYR	7.601	0.296	0.963	0.629
Kuwait	7.654	0.560	0.675	0.617
Mauritania	7.762	0.725	0.992	0.858
Oman	7.796	0.413	0.846	0.630
Latvia	7.798	0.550	0.886	0.718
Jamaica	7.861	0.706	0.935	0.820
Panama	7.935	0.640	0.923	0.782
Congo, Republic of	7.984	0.654	0.983	0.819
Uruguay	8.106	0.221	0.857	0.539
Albania	8.149	0.263	0.980	0.622
Costa Rica	8.202	0.334	0.906	0.620
Moldova	8.202	0.794	0.994	0.894
Lithuania	8.212	0.357	0.521	0.439
Ireland	8.229	0.284	0.494	0.389

	Log of population	Vulnerability index standardised	GDP per capita standardised	EVIAR
Armenia	8.242	0.531	0.991	0.761
New Zealand	8.245	0.245	0.682	0.464
Singapore	8.294	0.743	0.528	0.635
Norway	8.403	0.416	0.214	0.315
Croatia	8.407	0.368	0.899	0.633
Togo	8.407	0.704	0.995	0.850
Papua New Guinea	8.445	0.389	0.985	0.687
Kyrgyz Republic	8.483	0.526	0.996	0.761
Nicaragua	8.504	0.442	0.988	0.715
Finland	8.550	0.219	0.444	0.332
Denmark	8.580	0.311	0.277	0.294
Paraguay	8.587	0.227	0.968	0.598
Slovak Republic	8.594	0.273	0.917	0.595
Israel	8.719	0.339	0.617	0.478
El Salvador	8.725	0.277	0.956	0.617
Honduras	8.753	0.409	0.982	0.696
Jordan	8.762	0.555	0.974	0.764
Hong Kong	8.796	0.546	0.443	0.494
Switzerland	8.873	0.136	0.191	0.164
Azerbaijan	8.980	0.447	0.990	0.718
Austria	8.999	0.166	0.430	0.298
Bolivia	9.005	0.229	0.979	0.604
Sweden	9.089	0.159	0.390	0.274
Senegal	9.136	0.355	0.991	0.673
Tunisia	9.154	0.326	0.954	0.640
Portugal	9.206	0.185	0.753	0.469
Hungary	9.217	0.225	0.895	0.560
Belarus	9.218	0.488	0.977	0.733
Niger	9.220	0.484	0.999	0.741
Belgium	9.233	0.294	0.458	0.376
Czech Republic	9.238	0.236	0.881	0.559
Greece	9.247	0.501	0.737	0.619
Guatemala	9.314	0.211	0.963	0.587
Ecuador	9.426	0.345	0.973	0.659
Cameroon	9.527	0.304	0.987	0.646
Kazakhstan	9.614	0.327	0.973	0.650
Chile	9.617	0.290	0.887	0.588
Madagascar	9.649	0.356	0.997	0.676
Netherlands	9.668	0.279	0.444	0.361
Cote d'Ivoire	9.669	0.401	0.987	0.694
Yemen, Republic of	9.780	0.526	0.994	0.760

	Log of population	Vulnerability index standardised	GDP per capita standardised	EVIAR
Ghana	9.782	0.420	0.994	0.707
Australia	9.850	0.141	0.545	0.343
Sri Lanka	9.855	0.318	0.983	0.650
Uganda	9.881	0.457	0.995	0.726
Nepal	10.015	0.250	0.997	0.624
Romania	10.020	0.158	0.964	0.561
Malaysia	10.031	0.449	0.921	0.685
Venezuela	10.074	0.356	0.898	0.627
Peru	10.136	0.186	0.953	0.570
Morocco	10.249	0.208	0.974	0.591
Sudan	10.302	0.260	0.994	0.627
Kenya	10.309	0.391	0.994	0.693
Canada	10.326	0.089	0.504	0.297
Tanzania	10.443	0.368	0.997	0.682
Argentina	10.507	0.077	0.821	0.449
Poland	10.562	0.134	0.909	0.522
Spain	10.582	0.192	0.670	0.431
Colombia	10.635	0.194	0.954	0.574
South Africa	10.668	0.113	0.933	0.523
Korea	10.755	0.225	0.812	0.518
Italy	10.962	0.062	0.547	0.305
France	10.984	0.099	0.460	0.279
United Kingdom	10.992	0.081	0.447	0.264
Ethiopia	11.000	0.543	1.000	0.771
Thailand	11.030	0.278	0.958	0.618
Egypt	11.045	0.504	0.970	0.737
Iran, Islamic Rep	11.047	0.389	0.905	0.647
Turkey	11.083	0.140	0.934	0.537
Philippines	11.231	0.371	0.981	0.676
Germany	11.316	0.076	0.436	0.256
Mexico	11.496	0.035	0.887	0.461
Nigeria	11.620	0.518	0.992	0.755
Japan	11.749	0.081	0.211	0.146
Pakistan	11.809	0.267	0.992	0.630
Bangladesh	11.810	0.240	0.995	0.617
Russia	11.890	0.184	0.965	0.575
Brazil	12.013	0.001	0.917	0.459
Indonesia	12.243	0.133	0.988	0.561
United States of America	12.516	0.046	0.221	0.134
India	13.794	0.154	0.992	0.573
China, P.R. (mainland)	14.051	0.000	0.984	0.492