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Economic Vulnerability and Resilience

Concepts and Measurements

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Abstract

In this paper, economic vulnerability is defined as the exposure of an economy to exogenous shocks, arising out of economic openness, while economic resilience is defined as the policy-induced ability of an economy to withstand or recover from the effects of such shocks. The paper briefly reviews the work already carried out on economic vulnerability and extends the research towards the development of a conceptual and methodological framework for the definition and measurement of economic resilience. Towards this end, the paper proposes an index of economic resilience gauging the adequacy of policy in four broad areas, namely macroeconomic stability, microeconomic market efficiency, good governance and social development.

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Keywords: economic vulnerability, economic resilience, small states

JEL classification: O1, O10, O5, O57

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The analysis of economic resilience explains how small economies can attain a relatively high level of gross domestic product (GDP) per capita if they adopt appropriate policy stances. In other words, the relatively good economic performance of a number of small states is not because, but in spite of, their small size and inherent economic vulnerability. The results of this study can be used as a tool towards the formulation of policies aimed at overcoming the adverse consequences of economic vulnerability.

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1 Introduction[1]

Many small states[2] manage to generate a relatively high GDP per capita in comparison to other developing countries[3] in spite of their high exposure to exogenous economic shocks. This would seem to suggest that there are factors which may offset the disadvantages associated with economic vulnerability. This phenomenon is termed by Briguglio (2003) as the 'Singapore paradox', referring to the reality that although Singapore is highly exposed to exogenous shocks, this small island state has managed to register high rates of economic growth and to attain high GDP per capita. This reality can be explained in terms of the ability of Singapore to build its resilience in the face of external shocks.

Economic vulnerability, from the conceptual and empirical viewpoints, is well-documented in the literature (see, for example, Briguglio 1995, 2003; Atkins, Mazzi and Easter 2000). Most studies on economic vulnerability provide empirical evidence that small states, particularly island ones, tend to be characterized by high degrees of economic openness and export concentration. These lead to exposure to exogenous shocks, that is, economic vulnerability, which could constitute a disadvantage to economic development by magnifying the element of risk in the growth process, without necessarily compromising the overall viability. Cordina (2004a, 2004b) shows that increased risk can adversely affect economic growth as the negative effects of downside shocks would be commensurately larger than those of positive shocks. The high degree of fluctuations in GDP and in export earnings registered by many small states is considered as one of the manifestations of exposure to exogenous shocks.

This paper is structured as follows. The next section revisits the so-called 'Singapore Paradox'. Sections 3 and 4 respectively deal with the definitions of economic vulnerability and economic resilience. Section 5 reviews alternative approaches towards constructing a resilience index and presents the results of a feasible methodology. Section 6 deals with the relationship between GDP per capita, resilience and vulnerability. The potential uses of the resilience index are discussed in section 7. Section 8 concludes the study with some implications relating to the resilience index.

2 The 'Singapore paradox'

The 'Singapore paradox' refers to the seeming contradiction that a country can be highly exposed to exogenous shocks, rendering it economically vulnerable and yet still manages to attain high levels of GDP per capita.

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1 This is an updated and revised version of a paper by the same authors presented in Briguglio et al. (2006).

2 In this study, the words 'state' and 'country' are used synonymously. There is no generally agreed definition as to which variable should be used to measure the size of countries and as to what should be the cut-off point between a small country and other countries. Generally speaking, population is used as an indicator of country size.

3 This finding is reported in many studies. See for example Briguglio (1995).

Briguglio (2003, 2004) explains this in terms of the juxtaposition of economic vulnerability and economic resilience and proposes a methodological approach in this regard. In this approach, economic vulnerability is ascribed to inherent conditions affecting a country's exposure to exogenous shocks, while economic resilience is associated with actions undertaken by policymakers and private economic agents which enable a country to withstand or recover from the negative effects of shocks. Actions which enable a country to better benefit from positive shocks are also considered to be conducive to economic resilience.[4]

On the basis of this approach, Briguglio (2004) identifies four possible scenarios into which countries may be placed according to their vulnerability and resilience characteristics. These scenarios are termed as *best case*, *worst case*, *self-made*, and *prodigal son*.

The *best-case* category applies to countries that are not inherently vulnerable and which, at the same time, adopt resilience-building policies. The *worst-case* category refers to countries that compound the adverse effects of inherently high vulnerability by adopting policies that run counter to economic resilience. Countries classified as *self-made* are those with a high degree of inherent economic vulnerability, but which are economically resilient through the adoption of appropriate policies that enable them to cope with or withstand the effects of their inherent vulnerability. Countries falling within the *prodigal son* category are those with a relatively low degree of inherent economic vulnerability but whose policies are deleterious to economic resilience, thereby exposing them to the adverse effects of shocks.[5]

These four scenarios are depicted in Figure 1, where the axes measure inherent economic vulnerability and nurtured resilience, respectively.

This method of defining vulnerability in terms of inherent features and resilience in terms of policy-induced changes has a number of advantages. First, the vulnerability index would refer to permanent (or quasi-permanent) features over which a country can practically exercise no control and therefore cannot be attributed to inadequate policies. In other words, countries scoring highly on the index cannot be accused of inflicting vulnerability on themselves through misguided policy approaches. Second, the resilience index would refer to what a country can do to mitigate or exacerbate its inherent vulnerability. Scores on this index would, therefore, reflect the appropriateness of policy measures. Third, the combination of the two indices would indicate the overall risk of being harmed by external shocks due to inherent vulnerability features counterbalanced to different extents by policy measures.

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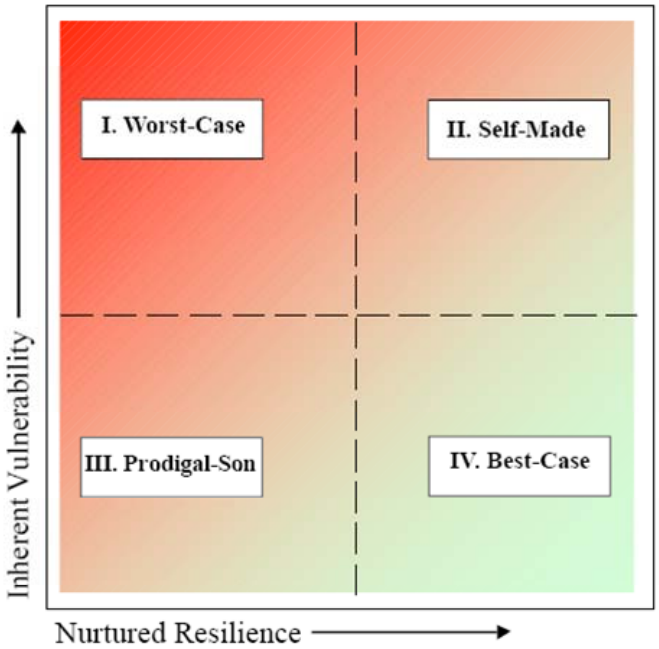
4 Cordina (2004a; b) introduces the concept of exposure to shocks within a mainstream model of economic growth based on the neoclassical paradigm to show that the per capita GDP of a country depends positively on its resources and productivity and negatively on its inherent vulnerability. It is further shown that the negative impact of vulnerability depends upon the degree of diminishing marginal productivity in a country, which can be influenced by policy actions and is therefore consistent with the notion of resilience. The application of this approach shows that capital formation and the fostering of economic conditions which retard the onset of diminishing marginal productivity, including amongst others, macroeconomic buffers and microeconomic market flexibility can be important sources of resilience.

5 The analogy with the prodigal son is that these countries, though 'born in a good family', squander their riches.

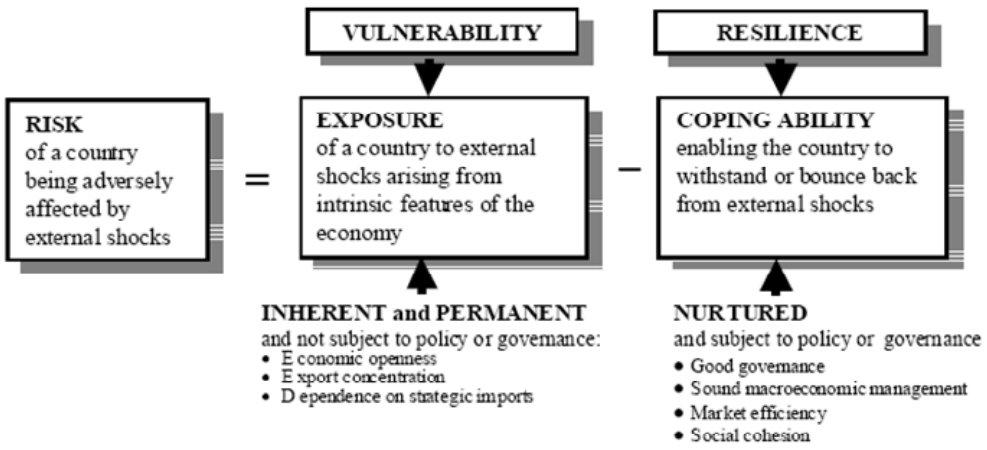
Figure 1
The four scenarios



Source: Briguglio (2004).

Given that vulnerability refers to inherent characteristics which render countries prone to exogenous shocks, vulnerability scores for a particular country should not differ much over time, and therefore it is not expected that a country moves vertically along the quadrants of Figure 1. But horizontal movement is possible for those countries that adopt measures which build resilience and vice versa. It would thus be possible for countries to switch between the worst-case and the self-made scenarios, or the prodigal son and the best-case scenarios, through changes in their economic policies.

Figure 2
Risks associated with being adversely affected by external shocks



Source: Briguglio (2004).

By distinguishing between inherent economic vulnerability and nurtured economic resilience, it is possible to create a methodological framework for assessing the risk of being affected by external shocks, as shown in Figure 2.

Figure 2 shows that risk has two elements, the first is associated with the inherent conditions of the country that is exposed to external shocks and the second associated with conditions developed to absorb, cope with or bounce back from adverse shocks. The risk of being adversely affected by external shocks is therefore the combination of the two elements. The negative sign in front of the resilience element indicates that the risk is reduced as resilience builds up.

3 Economic vulnerability

Empirical work on the construction of an economic vulnerability index (see Briguglio 1995; Briguglio and Galea 2003; Farrugia 2004) is often based on the premise that a country's proneness to exogenous shocks stems from a number of inherent economic features, including high degrees of economic openness, export concentration and dependence on strategic imports.[6]

3.1 Economic openness

Economic openness can be measured as the ratio of international trade to GDP. A high degree of economic openness renders a country susceptible to external economic conditions over which it has no direct control. Economic openness is to a significant extent an inherent feature of an economy, conditioned mainly by (i) the size of the country's domestic market affecting the exports-to-GDP ratio, and (ii) by the country's availability of resources and its ability to efficiently produce the range of goods and services required to satisfy its aggregate demand, affecting the imports-to-GDP ratio. It may be argued that openness to international trade may be influenced by policy and is therefore a nurtured resilience issue.[7] Practical experience however shows that trade policies tend to influence more the type of a country's external trade flows rather than the degree of economic openness. Countries with a relatively small domestic market have very few options but to resort to exports, and those with limited natural resources, tend to be highly dependent on imports. It can be further argued that openness to international trade could be a source of strength, in that it may indicate that a country is successfully participating in the international markets. This argument however does not detract from the fact that by participating more actively in international trade, a country would be exposing itself to a larger degree of shocks over which it has relatively little control.

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6 Farrugia (2004) elaborates further on these ideas by considering the economic strength of trading partners as a proxy for the probability of shocks to exports.

7 This issue is discussed at length in Guillaumont (2004).

3.2 Export concentration

Dependence on a narrow range of exports gives rise to risks associated with lack of diversification, and therefore exacerbates vulnerability associated with economic openness. Again this condition is, to a large extent, the result of inherent features in the production base of an economy and reflects the fact that small size restricts a country's ability to diversify its exports. Export concentration can be measured by the UNCTAD index of merchandise trade (UNCTAD 2003: section 8). Briguglio (1997) and Briguglio and Galea (2003) have devised an alternative index which also takes services into account.

3.3 Dependence on strategic imports

Another facet of the exposure argument relates to the dependence on strategic imports, which would expose an economy to shocks with regard to the availability and costs of such imports. This variable can be measured as the ratio of the imports of energy, food or industrial supplies to GDP. Again, this condition is, to a large extent, inherent in that it depends on country size, resource endowments and possibilities for import substitution.

All vulnerability indices utilizing these or similar variables come to the conclusion that there is a tendency for small states to be more vulnerable economically than other groups of countries.

4 Economic resilience

In this paper, economic resilience refers to the policy-induced ability of an economy to recover from or adjust to the negative impacts of adverse exogenous shocks and to benefit from positive shocks.[8] The term is used in two senses in this paper, respectively relating to the ability to: (i) recover quickly from a shock; and (ii) withstand the effect of a shock.[9]

Ability of an economy to recover from the effects of adverse shocks

This is associated with the flexibility of an economy, enabling it to bounce back after being adversely affected by a shock. This ability will be severely limited if, for example, there is a chronic tendency for large fiscal deficits. On the other hand, this ability will be enhanced when the economy possesses discretionary policy tools which it can utilize to counteract the effects of negative shocks, such as a strong fiscal position, which would entail that policymakers can utilize discretionary expenditure or tax cuts to contrast the effects of negative shocks. This type of resilience is therefore associated with 'shock-counteraction'.

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8 Most dictionaries define resilience in terms of the ability to recover quickly from the effect of an adverse incident. This definition originates from the Latin *resilire* 'to leap back'.

9 An analogy relating to an attack of influenza virus may help explain the two senses in which the term 'resilience' is used. A person exposed to the virus may (i) get infected but recovers quickly; and/or (ii) withstand the effect of the virus, possibly by being immunized.

Ability to withstand shocks

This relates to the ability to absorb shocks, so that the end effect of a shock is neutered or rendered negligible. This type of resilience occurs when the economy has mechanisms in place to reduce the effects of shocks, which can be referred to as shock absorption'. For example, the existence of a flexible, multi-skilled labour force could act as an instrument of shock absorption, as negative external demand shocks affecting a particular sector of economic activity can be relatively easily met by shifting resources to another sector enjoying stronger demand.

Importance of resilience considerations

The issue of resilience building is important for small states in view of the fact that such states tend to be inherently economically vulnerable, as already explained. In an analysis of the economic performance of small states, it is important to distinguish between vulnerability considerations and resilience factors.

For example, some studies argue that small economic size presents an economic advantage on the basis of simple correlations between small size and indicators of economic performance, such as GDP growth and GDP per capita. However, a proper analysis of the relationship between size of countries and economic performance should factor in control variables, such as good economic governance. This paper suggests that the relatively good performance of some small states is certainly not due to small size, but is attributed to nurtured economic resilience. In other words, the relatively good economic performance of a number of small states is not because, but in spite, of their small size and inherent economic vulnerability.

Consideration of economic resilience building also conveys the message that small vulnerable states should not be complacent in the face of their economic vulnerability, but could and should adopt policy measures to enable them to improve their ability to cope with or bounce back from external shocks.

5 The construction of a resilience index

5.1 Underlying difficulties of index construction

This section presents the results of an attempt to construct a composite index of economic resilience. Some words of caution are warranted at this stage. The choice of variables which compose the index is somewhat subjective. However care was taken to base the choice on a set of desirable criteria related to 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) and Farrugia (2007). In addition, the summing of the components of the index also involves subjective decisions, principally in selecting the weighting procedure. There is considerable debate in the literature on composite indices on this issue. Again, these questions are discussed in Briguglio (2003) and Farrugia (2007) and are not elaborated upon in this study.

The compilation of the index encountered a number of problems with regard to data collection, the most important of which were associated with shortage of data and non-

homogenous definitions across countries. Briguglio (2003) considers these problems, referring to the fact that data problems occur particularly in the case of small states.

5.2 The components of the resilience index

The resilience index proposed in this section is intended to measure the effect of shock absorption or shock counteraction policies across countries. It is hypothesized that the variables that capture these effects are the following:

- macroeconomic stability;
- microeconomic market efficiency;
- good governance; and
- social development.

Macroeconomic stability

Macroeconomic stability relates to the interaction between an economy's aggregate demand and aggregate supply. If aggregate expenditure in an economy moves in equilibrium with aggregate supply, the economy would be characterized by internal balance, as manifested in a sustainable fiscal position, low price inflation and an unemployment rate close to the natural rate, as well as by external balance, as reflected in the international current account position or by the level of external debt.

These can be considered to be variables which are highly influenced by economic policy and which could act as good indicators of an economy's resilience in facing adverse shocks.

The macroeconomic stability component of the resilience index proposed in this study consists of three variables, namely (i) the fiscal deficit-to-GDP ratio; (ii) the sum of the unemployment and inflation rates; and (iii) the external debt-to-GDP ratio. The variables are available for a reasonably wide set of countries spread over a spectrum of stages of development, size and geographical characteristics.

Fiscal deficit

The government budget position is suitable for inclusion in the resilience index because it is the result of fiscal policy, which is one of the main tools available to government, and relates to resilience of a shock-counteracting nature. This is because a healthy fiscal position would allow adjustments to taxation and expenditure policies in the face of adverse shocks. The fiscal deficit, standardized as a ratio to GDP, is thus included in the resilience index proposed in this study.

Inflation and unemployment

Price inflation and unemployment are also considered to be suitable indicators of resilience and at the same time they potentially provide additional information to that contained in the fiscal deficit variable. This is because price inflation and unemployment are strongly influenced by other types of economic policy, including monetary and supply-side policies. They are associated with resilience because if an economy already has high levels of unemployment and inflation, it is likely that adverse shocks would impose significant costs on it. If on the other hand, the economy has low

levels of inflation and unemployment, then it can withstand adverse shocks to these variables without excessive welfare costs. In this sense, therefore, unemployment and inflation are associated with resilience of a shock-absorbing nature. The sum of these two variables, also known as the economic discomfort index (or economic misery index), is thus included in the resilience index proposed here.

External debt

The adequacy of external policy may be gauged through the inclusion of the external debt-to-GDP ratio. This is considered to be a good measure of resilience, because a country with a high level of external debt may find it more difficult to mobilize resources in order to offset the effects of external shocks. Thus, this variable would indicate resilience of a shock-counteracting nature.[10]

The sources of the data and country rankings associated with the macroeconomic stability component of the resilience index are presented in Table 1A in the Appendix. As can be seen, a number of small states, notably Singapore and Hong Kong, obtain relatively high scores on this component.

Microeconomic market efficiency

The science of economics views markets and their efficient operation through the price mechanism as the best way to allocate resources in the economy. If markets adjust rapidly to achieve equilibrium following an external shock, the risk of being negatively affected by such a shock will be lower than if market disequilibria tend to persist. Indeed, with very slow or non-existent market adjustment, resources will not be efficiently allocated in the economy, resulting in welfare costs, manifested, for instance, in unemployed resources and waste or shortages in the goods markets. These considerations have important implications for shock-absorbing resilience.

Not many indicators of market efficiency are available, which span a sufficiently wide range of countries as required for the purpose of this study. Following a search for suitable indicators, it was decided to use a component of the *Economic Freedom of the World Index* (Gwartney and Lawson 2005), entitled 'regulation of credit, labour and business' which is aimed at measuring the extent to which markets operate freely, competitively and efficiently across countries. It is designed to identify the effect of regulatory restraints and bureaucratic procedures on competition and the operation of markets.

In the financial market this index assesses the extent to which (i) the banking industry is dominated by private firms; (ii) foreign banks are permitted to compete in the market; (iii) credit is supplied to the private sector; and (iv) controls on interest rates interfere with the credit market. All these relate to the degree of interference by government in the financial market, which could preclude the economy from reacting flexibly to shocks.

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10 It is however recognized that certain countries may have external debt not because of a weak policy framework but due to a highly-developed international financial activity. This is a weakness in the use of this indicator. However the inclusion of other variables related to market efficiency and governance would to an extent 'correct' this weakness, since these variables either exacerbate the effect of external debt in the presence of a weak policy framework or counteract it otherwise.

Similar considerations apply in the case of the labour market. Here interference relates to unduly high unemployment benefits (which could undermine the incentive to accept employment), dismissal regulations, minimum wage impositions, centralized wage setting, extensions of union contracts to non-participating parties and conscription. All these are viewed as possibly precluding work effort, thereby limiting the ability of a country to recover from adverse shocks. A country would have a higher market efficiency score if it allows market forces to determine wages and establish conditions of dismissal, avoid excessive unemployment, and refrain from the use of conscription.

Bureaucratic control of business activities is also thought to inhibit market efficiency. This subcomponent is designed to identify the extent to which bureaucratic procedures limit competition and the operation of markets. When such activities retard entry into business and increase the cost of production, when prices are not market-determined and when governments use their power to extract financial payments and reward some businesses at the expense of others, private sector involvement is discouraged, thereby inhibiting the freely-operating markets to absorb shocks.

The relative data and country-ranking results with regard to this component of the resilience index are presented in Table 1A in the Appendix. Small vulnerable countries can be found across the entire range of this component, indicating that such countries are adopting different policy approaches in terms of microeconomic efficiency.[11]

Good governance

Good governance is essential for an economic system to function properly and hence to be resilient. Governance relates to issues such as rule of law and property rights. Without mechanisms of this kind in place, it would be relatively easy for adverse shocks to result in economic and social chaos and unrest. Hence the effects of vulnerability would be exacerbated. On the other hand, good governance can strengthen an economy's resilience.

The *Economic Freedom of the World Index* has a component which focuses on legal structure and security of property rights.[12] This is considered to be useful in the context of the present exercise in deriving an index of good governance. The component covers

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11 An attempt was made to augment the microeconomic market efficiency indicator used in the resilience index by assessing the degree of exchange rate and financial controls exercised by countries covered in the resilience index. The premise is based on the notion that countries that use capital controls are not likely to have efficient financial markets. In turn, due to the strong interlinkages between financial markets and the entire economy, inefficiencies in the financial markets are likely to reflect and result in inefficiencies in other sectors of the economy. The IMF *Annual Report on Exchange Arrangements and Exchange Restrictions* (2006) was used to identify the presence of such controls. This approach, however, met with a number of practical difficulties including the fact that the IMF yields a *de jure* classification of exchange rate regimes based on the stated intentions of the central banks. However, difficulties arise when actual policies diverge from the stated intentions. Moreover, given the numerous and often complicated controls exercised by a number of countries, a relevant comparison of the controls across countries is difficult to obtain.

12 An alternative governance index is presented by the World Bank (Kaufmann, Kraay and Mastruzzi 2006). A Pearson correlation test of the World Bank governance indicators and the Economic Freedom of the World's 'legal structure and security of property rights' component yielded a value of 0.92. Thus, both indices are likely to be measuring a similar phenomenon. In fact when the Kaufmann index was used in the compilation of the resilience index, the ranking of countries only changed marginally.

five subcomponents, namely (i) judicial independence; (ii) impartiality of courts; (iii) the protection of intellectual property rights; (iv) military interference in the rule of law; and (v) political system and the integrity of the legal system.

The relative data and country-ranking results are presented in Table 1A in the Appendix. The highest rankings on the governance component are the more economically advanced countries, with the first five placings occupied by major industrialized economies. Singapore, which was among the most resilient economies according to economic criteria, ranks 15th in terms of governance. Vulnerable economies tend to obtain lower rankings on this count, but it still appears to be the case that the vulnerable economies enjoying a higher per capita GDP also tend to have better systems of governance.

Social development

Social development is another essential component of economic resilience. This factor indicates the extent to which relations within a society are properly developed, enabling an effective functioning of the economic apparatus without the hindrance of civil unrest. Social development can also indicate the extent to which effective social dialogue takes place in an economy which, in turn, would enable collaborative approaches towards the undertaking of corrective measures in the face of adverse shocks.

Social development in a country can be measured in a number of ways. Variables relating to income, such as its dispersion and the proportion of the population living in poverty, the long-term unemployment rate (indicating the proportion of the population with low skills and inadequate employment prospects) and the proportion of the population with low levels of education, could be useful indicators. Still another possible approach would be to measure the number and extent of instances of industrial or civil unrest. These approaches are interesting but rather narrow in scope and very difficult to measure across countries.

The social development component of the resilience index in this paper consists of the education and health indicators utilized to construct the UNDP human development index (HDI).

- *Education*: Educational advancement, measured by the adult literacy rate and school enrolment ratios, is considered to be a good indicator of social development. In addition, an improved standard of education could be indicative of an improved ability to cohere in the face of external shocks—a condition conducive to economic resilience.
- *Health*: Life expectancy at birth is considered to be suitable for measuring the health aspects in a society. This in turn is likely to be related to medical facilities, housing and degree of proneness to accident or risk of injury. Again, advancement in health standards is considered to be conducive to economic resilience.

The relative data and country ranking results are presented in Table 1A in the Appendix. Small island developing states occupy the entire range of the component, with those with a high per capita GDP obtaining higher rankings.

Correlation between the components of the index

The components discussed above have been found to be positively related to each other, as shown in Table 1, but the correlation is somewhat weak.

Table 1
Correlation matrix

Macroeconomic stability	1.00			
Market efficiency	0.17	1.00		
Good governance	0.29	0.68	1.00	
Social development	0.22	0.40	0.67	1.00

The highest correlation scores relate to good governance and social development and good governance and market efficiency.

The question arises therefore as to whether or not the good governance component is redundant. Given that its correlation with market efficiency and social development is not unduly high, it was decided to retain all four components in the composite index.

Other determinants of economic resilience

Economic resilience can also be viewed to be determined by a plethora of other factors apart from those mentioned above. It may be argued, for example, that it could be useful to consider the effects of environmental management in this regard. The environment can be an important source of vulnerability by giving rise to shocks of an adverse nature, principally by rapid events, such as earthquakes and floods. In turn, these would have important repercussions on the economy and society.

In this regard, the efforts undertaken to compile the Environmental Sustainability Index (Esty et al. 2005) are commendable. Data on environmental matters are however not readily and extensively available across countries of different sizes and the inclusion of environmental variables for the present exercise would have drastically reduced the countries covered by the resilience index.[13] In addition, there is the possibility that incorporating an environmental management index could lead to the problem of redundancy, that is, using indicators which are highly correlated which would add no new information but would render the procedure unnecessary complex. In the case of environmental management factors, the socioeconomic resilience aspects covered by the variables discussed above are likely to be highly correlated with environmental management, although in the absence of data, this assertion cannot be tested.

Computation of the composite index

The composite index was computed by taking a simple average of the four components just described, namely: macroeconomic stability, microeconomic market efficiency, good governance and social development. Data for 86 countries were obtained. All

13 Esty et al. (2005) do produce some results for a few small states but they are reluctant to include them in the Environmental Sustainability Index.

observations of the components of the index were standardized using the well-known transformation:

$$XS\mathbf{ij} = (X\mathbf{ij} - MinX\mathbf{j}) / (MaxX\mathbf{j} - MinX\mathbf{j}) \qquad j = 1,2, \ldots 4 ; i = 1,2, \ldots 86.$$

where:

- XS**ij** is the value of the standardized observation for country **i** of component **j**;
- X**ij** is the actual value of the same observation;
- MinX**j** and MaxX**j** are the minimum and maximum values of the same observations for component **j**.

This transforms the values of observations in a particular variable array so that they take a range of values from 0 to 1.

The results

The results of averaging the four components of the economic resilience index are given in Table 1A in the Appendix. These show that most of the small island states included in the index, namely Singapore, Barbados, Malta and Cyprus, register relatively high resilience scores. Other small states with relatively high resilience scores include Iceland, Hong Kong, Slovenia and Estonia. Unfortunately data for small island developing states that register low resilience scores were available for two countries only, namely Jamaica and Papua New Guinea. It is, therefore, not possible to compare the performance of country groupings in this regard. However, it appears that the worst performers in terms of resilience building were a number of larger African, Asian and South American countries.

6 GDP per capita, resilience and vulnerability

It would be interesting to investigate the extent to which GDP per capita of the different countries is explained by vulnerability and resilience.

Using the ordinary least squares (OLS) method of regression, GDP per capita was regressed on the vulnerability index (as proposed in Briguglio and Galea 2003, reproduced here as Table 3A in the Appendix) and on the resilience index produced in this study. The results are shown in Table 2.

In Table 2, G represents GDP per capita; R represents the resilience index; and V represents the vulnerability index. All variables have been standardized as explained above, so that their values range between 0 and 1.

Table 2
Regression results

G =	0.14	+	0.95R	-	0.14V
t statistics	*(3.5)*		*(17.2)*		*(-2.4)*
$R^2 = 0.78$	Number of observations = 86				

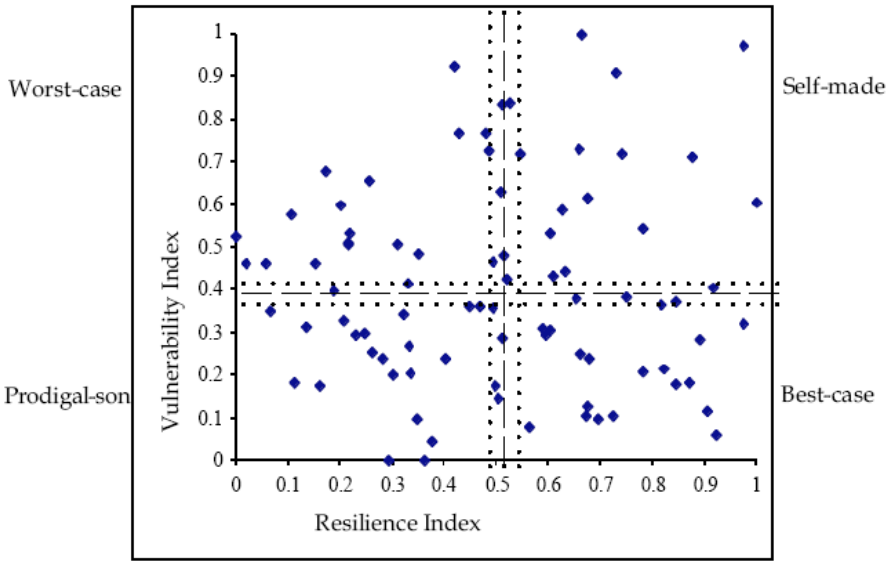
This result confirms the hypothesis in Briguglio (2004) and Cordina (2004a, 2004b) that the performance of countries depends on their inherent vulnerability and their nurtured resilience. It also confirms that the resilience index is highly correlated with GDP per capita, with countries having the highest GDP per capita, being, as expected, those with the highest resilience scores.[14] This is not an extraordinary finding, because it validates a very plausible assumption. However the results of the regression exercise have some interesting implications. In particular, the results show that the economic well-being of nations is more dependent on man-made policies than on inherent vulnerabilities. The results also confirm that adequate policy approaches can be used to successfully overcome the handicaps posed by vulnerability.

6.1 The country scenarios

Going back to the scenarios proposed in Figure 1, it is possible to place the countries included in the index in the four quadrants shown therein, using the resilience index proposed in this study and the vulnerability index presented by Briguglio and Galea (2003). The results are shown in Figure 3. It should be pointed out that the cutoff values chosen for the quadrants (represented by the dashed lines in Figure 3) are the averages of the vulnerability and resilience scores for all countries.

This decision is subjective and the classification of countries will change if different cutoff points are chosen. Consequently, it was decided to allow a 'borderline' margin of +/-5 per cent for the vulnerability and resilience indices (shown by the dotted-lines on each side of the dashed lines) and countries falling within these margins are classified as 'borderline' cases.

Figure 3
Economic resilience and economic vulnerability



Source: Computed by the authors.

[14] The relationship between GDP per capita and the resilience index (i.e., excluding the vulnerability variable) exhibits a high correlation coefficient (R^2 = 0.77) and t-statistic (t = 16.7). However, the inclusion of the vulnerability variable in the equation improves the results by producing a higher correlation coefficient and a higher t-statistic on the resilience variable, as shown above.

Table 2A in the Appendix shows the classification of countries within the different quadrants. The overall tendencies that can be derived from Table 2A are that:

- countries falling in the *best-case* quadrant are mostly the large 'developed countries';
- countries falling in the *self-made* quadrant include a number of small states with a high vulnerability score;
- countries which fall in the *prodigal son* quadrant include mostly large third world countries; and
- countries falling in the *worst-case* quadrant include a few vulnerable small countries with weak economic performance.

7 The uses of the resilience index

The resilience index developed in this paper may be useful to support decisionmaking, especially for setting directions and justifying choice of priorities for resilience building. In particular it could help to:

- disseminate information on and draw attention to the issue of resilience building;
- focus the discussion on essential resilience-building issues; and
- promote the idea of integrated action.

Dissemination of information

An index is a very good instrument for drawing attention to the issue being investigated. Thus for example, the exercise of computing an index of resilience may itself make decisionmakers and stakeholders more aware of the factors that lead to resilience building. Such an exercise may also generate academic discussion and enhance awareness amongst scholars and practitioners on the issues involved.

The resilience index can also be used to give high profile to certain policies which can strengthen resilience. In this regard, the index can be useful for communication and for alerting stakeholders about failures and success stories relating to resilience building.

Focusing the discussion

Indices can help to develop a common language for discussion. One often finds that parties engaged in debate go off at tangents because of lack of common definitions. In the case of indices, the quantification of their components requires precise definitions, and this could help focus the discussion on matters directly relevant to the issue.

Promoting the idea of integrated action

Although a composite index yields a single-value measure of the phenomena under consideration, it summarizes complex realities and therefore conveys the message that the issue under investigation is not the outcome of a single factor. This could help to foster an awareness of the interconnections between the components of the index. In the case of economic resilience, for example, it is often not enough, and may even be

counterproductive, to take action in one area in isolation from others. The resilience index proposed here could therefore promote the need for an integrated action in this regard.

8 Concluding considerations

This paper dealt with conceptual and methodological aspects associated with economic resilience and its measurement. The index developed here covers four aspects of economic resilience, namely macroeconomic stability, microeconomic market efficiency, good governance and social development. Each of these components contains variables which are considered suitable to gauge the extent to which the policy framework is conducive to absorb and counteract the effects of economic shocks.

The results of this exercise can provide an explanation as to why inherently vulnerable countries may register high levels of GDP per capita. It is argued that countries may be economically successful because they are inherently not vulnerable, or because they are resilient in the face of the vulnerability they face. The obverse is also true, in that countries may be unsuccessful because they are not sufficiently resilient.

The paper has also shown that GDP per capita is positively related to economic resilience and negatively related to economic vulnerability. Furthermore, per capita GDP is found to be more sensitive to resilience variables than to vulnerability variables.

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Appendix 1

Table 1A
The resilience index: data and country rankings

Country	Macroeconomic stability[a]	Microeconomic efficiency[b]	Good governance[c]	Social development[d]	Resilience index[e]	Country ranking
Albania	0.250	0.387	0.411	0.765	0.453	62
Argentina	0.534	0.259	0.227	0.868	0.472	58
Australia	0.472	0.800	0.971	0.988	0.808	9
Austria	0.693	0.531	0.928	0.956	0.777	12
Bangladesh	0.635	0.305	0.174	0.223	0.334	80
Barbados	0.632	0.627	0.722	0.915	0.724	17
Belgium	0.661	0.474	0.800	0.982	0.729	16
Belize	0.186	0.671	0.607	0.754	0.554	49
Bolivia	0.468	0.360	0.174	0.619	0.405	69
Brazil	0.388	0.210	0.423	0.721	0.436	65
Cameroon	0.443	0.451	0.344	0.232	0.368	76
Canada	0.633	0.798	0.910	0.977	0.829	6
Chile	0.636	0.562	0.611	0.859	0.667	28
China	0.653	0.095	0.468	0.704	0.480	56
Colombia	0.417	0.273	0.220	0.754	0.416	67
Costa Rica	0.609	0.470	0.623	0.853	0.639	31
Côte d'Ivoire	0.422	0.327	0.237	0.000	0.246	86
Croatia	0.524	0.516	0.451	0.824	0.579	40
Cyprus	0.360	0.407	0.687	0.886	0.585	38
Czech Republic	0.571	0.444	0.631	0.856	0.626	35
Denmark	0.716	0.682	1.000	0.944	0.836	5
Dominican Republic	0.657	0.470	0.305	0.654	0.521	52
Egypt, Arab Rep.	0.588	0.151	0.403	0.504	0.412	68
El Salvador	0.655	0.485	0.351	0.645	0.534	51
Estonia	0.635	0.705	0.673	0.850	0.716	18
Finland	0.638	0.671	0.997	0.971	0.819	7
France	0.494	0.526	0.744	0.962	0.681	23
Germany	0.551	0.349	0.932	0.947	0.695	20
Honduras	0.425	0.388	0.157	0.584	0.389	71
Hong Kong, China	0.650	1.000	0.731	0.865	0.811	8
Hungary	0.435	0.598	0.656	0.830	0.630	34
Iceland	0.722	0.912	0.960	0.968	0.890	1
India	0.501	0.309	0.555	0.396	0.440	64
Indonesia	0.420	0.060	0.285	0.633	0.350	78
Iran, Islamic Rep.	0.595	0.000	0.555	0.630	0.445	63
Ireland	0.748	0.632	0.855	0.927	0.790	11
Israel	0.599	0.348	0.730	0.933	0.652	29
Italy	0.564	0.277	0.669	0.930	0.610	36
Jamaica	0.404	0.413	0.468	0.783	0.517	53
Japan	0.473	0.530	0.745	0.974	0.681	24
Jordan	0.388	0.480	0.637	0.727	0.558	48
Kenya	0.489	0.471	0.283	0.299	0.385	73
Kuwait	0.579	0.656	0.705	0.748	0.672	27
Latvia	0.523	0.490	0.555	0.824	0.598	37
Lithuania	0.548	0.391	0.471	0.848	0.564	46
Luxembourg	0.170	0.752	0.910	0.894	0.682	22
Madagascar	0.362	0.266	0.256	0.255	0.285	84
Malaysia	0.732	0.493	0.625	0.748	0.649	30
Malta	0.484	0.631	0.708	0.871	0.674	25
Mauritius	0.602	0.371	0.625	0.701	0.575	43
Mexico	0.607	0.281	0.294	0.777	0.490	55

Table 1A con't

Table 1A (con't)
The resilience index: data and country rankings

Country	Macroeconomic stability[a]	Microeconomic efficiency[b]	Good governance[c]	Social development[d]	Resilience index[e]	Country ranking
Morocco	0.496	0.373	0.566	0.405	0.460	60
Nepal	0.492	0.458	0.310	0.261	0.380	74
Netherlands	0.483	0.656	0.971	0.979	0.772	13
New Zealand	0.690	0.882	0.951	0.974	0.874	2
Nicaragua	0.024	0.486	0.187	0.566	0.316	82
Nigeria	0.472	0.509	0.219	0.232	0.358	77
Norway	0.557	0.550	0.910	0.982	0.750	14
Pakistan	0.395	0.414	0.148	0.205	0.291	83
Panama	0.582	0.536	0.384	0.806	0.577	42
Papua New Guinea	0.509	0.434	0.310	0.290	0.386	72
Paraguay	0.578	0.164	0.106	0.730	0.395	70
Peru	0.568	0.401	0.316	0.739	0.506	54
Philippines	0.451	0.388	0.285	0.771	0.474	57
Poland	0.569	0.304	0.520	0.874	0.567	45
Portugal	0.595	0.458	0.768	0.915	0.684	21
Romania	0.388	0.290	0.409	0.765	0.463	59
Russian Federation	0.517	0.092	0.348	0.751	0.427	66
Senegal	0.403	0.225	0.342	0.067	0.260	85
Singapore	1.000	0.730	0.888	0.877	0.874	3
Slovak Republic	0.446	0.446	0.536	0.830	0.564	47
Slovenia	0.660	0.308	0.664	0.903	0.634	33
South Africa	0.576	0.600	0.664	0.446	0.571	44
Spain	0.545	0.556	0.625	0.968	0.673	26
Sri Lanka	0.318	0.407	0.356	0.751	0.458	61
Sweden	0.474	0.574	0.949	1.000	0.749	15
Switzerland	0.557	0.744	0.912	0.950	0.791	10
Thailand	0.399	0.473	0.582	0.733	0.547	50
Trinidad and Tobago	0.641	0.562	0.557	0.780	0.635	32
Tunisia	0.511	0.484	0.683	0.651	0.582	39
Turkey	0.000	0.213	0.391	0.674	0.320	81
Uganda	0.516	0.424	0.370	0.199	0.377	75
United Kingdom	0.062	0.844	0.977	0.971	0.714	19
United States	0.646	0.907	0.860	0.944	0.839	4
Uruguay	0.523	0.376	0.537	0.874	0.577	41
Venezuela, RB	0.511	0.091	0.000	0.777	0.345	79

Notes:
[a] The macroeconomic stability sub-index is made up of the simple average of the following three variables: (i) the fiscal deficit to GDP ratio; (ii) the sum of the unemployment and inflation rates; and (iii) the external debt-to-GDP ratio. The data sources are IMF (2005) and World Bank (2004). National statistical offices were consulted for a few countries.

[b] The microeconomic efficiency index is a component of the Economic Freedom of the World Index (Gwartney and Lawson 2005), namely 'regulation of credit, labour and business' and is intended to measure the extent to which regulatory restraints and bureaucratic procedures limit competition and the operation of financial, labour and product markets. Data pertain to 2001 through 2003.

[c] The governance index consists of five components, namely (i) judicial independence; (ii) impartiality of courts; (iii) the protection of intellectual property rights; (iv) military interference in the rule of law; and (v) political system and the integrity of the legal system (source: Gwartney and Lawson 2005). Data pertain to 2001 through 2003.

[d] The social development index is the sum of the education and health indices of the HDI for the years 2000 to 2002 (see UNDP 2002, 2003, 2004). Education is measured by the adult literacy rate and school enrolment rates, while health is measured by life expectancy at birth.

[e] The resilience index is the simple average of the four indices in the previous four columns.

Table 2A
Four country scenarios

Country	Resilience index	Vulnerability index	Country	Resilience index	Vulnerability index
SELF-MADE			WORST CASE		
Barbados	0.741	0.717	Belize[c]	0.478	0.768
Costa Rica	0.609	0.436	Côte d'Ivoire	0.000	0.524
Croatia[a]	0.516	0.480	Dominican Republic	0.427	0.768
Cyprus	0.526	0.840	Egypt, Arab Rep.	0.257	0.658
Estonia	0.729	0.908	Honduras	0.221	0.534
Hong Kong, China	0.877	0.713	Iran, Islamic Rep.	0.309	0.508
Iceland	1.000	0.607	Jamaica	0.420	0.922
Israel	0.630	0.443	Jordan[c]	0.484	0.725
Kuwait	0.661	0.731	Kenya	0.216	0.511
Latvia	0.546	0.718	Lithuania[c]	0.494	0.466
Luxembourg	0.676	0.615	Madagascar	0.060	0.465
Malaysia	0.626	0.587	Nicaragua	0.107	0.578
Malta	0.663	1.000	Nigeria	0.173	0.677
Mauritius[a]	0.509	0.632	Papua New Guinea	0.216	0.508
Norway	0.781	0.543	Philippines	0.353	0.485
Panama[a]	0.514	0.837	Senegal	0.020	0.464
Singapore	0.974	0.971	Sri Lanka[d]	0.328	0.415
Tunisia[a]	0.521	0.426	Uganda	0.203	0.597
Trinidad and Tobago	0.603	0.533	Venezuela, RB	0.153	0.465
BEST CASE			PRODIGAL SON		
Australia	0.872	0.184	Albania	0.321	0.344
Austria	0.824	0.216	Argentina	0.350	0.100
Belgium	0.750	0.384	Bangladesh	0.136	0.313
Canada	0.905	0.117	Bolivia	0.247	0.299
Chile	0.653	0.379	Brazil	0.294	0.001
Czech Republic	0.589	0.309	Cameroon[a]	0.188	0.397
Denmark [c]	0.915	0.407	China	0.363	0.000
Finland	0.889	0.286	Colombia	0.263	0.254
France	0.675	0.129	El Salvador	0.447	0.362
Germany	0.696	0.100	India	0.301	0.201
Hungary	0.596	0.294	Indonesia	0.161	0.174
Ireland	0.845	0.371	Mexico	0.378	0.046
Italy	0.564	0.082	Morocco	0.332	0.272
Japan	0.674	0.106	Nepal	0.208	0.327
Netherlands	0.817	0.364	Pakistan	0.069	0.349
New Zealand	0.975	0.320	Paraguay	0.230	0.297
Portugal	0.680	0.242	Peru	0.403	0.242
Slovenia	0.601	0.307	Poland[b]	0.497	0.175
South Africa[d]	0.505	0.147	Romania	0.336	0.206
Spain	0.663	0.250	Russian Federation	0.281	0.241
Sweden	0.780	0.208	Slovak Republic[a]	0.494	0.357
Switzerland	0.845	0.178	Thailand	0.467	0.363
United Kingdom	0.725	0.106	Turkey	0.114	0.182
United States	0.921	0.060			
Uruguay[d]	0.514	0.288			

Notes: [a] Borderline with *worst case*
[b] Borderline with *best case*
[c] Borderline with *self-made*
[d] Borderline with *prodigal son*

Table A3
The Briguglio and Galea vulnerability index

Country	Index	Rank	Country	Index	Rank
Albania	0.263	50	Latvia	0.550	11
Argentina	0.077	81	Lithuania	0.357	32
Australia	0.141	71	Luxembourg	0.471	18
Austria	0.166	67	Madagascar	0.356	34
Bangladesh	0.240	53	Malaysia	0.449	21
Barbados	0.549	12	Malta	0.765	1
Belgium	0.294	42	Mauritius	0.484	17
Belize	0.588	7	Mexico	0.035	85
Bolivia	0.229	56	Morocco	0.208	61
Brazil	0.001	86	Nepal	0.250	51
Cameroon	0.304	41	Netherlands	0.279	45
Canada	0.089	78	New Zealand	0.245	52
Chile	0.290	43	Nicaragua	0.442	22
China	0.000	87	Nigeria	0.518	14
Colombia	0.194	62	Norway	0.416	23
Costa Rica	0.334	37	Pakistan	0.267	49
Côte d'Ivoire	0.401	26	Panama	0.640	6
Croatia	0.368	31	Papua New Guinea	0.389	29
Cyprus	0.643	5	Paraguay	0.227	57
Czech Republic	0.236	54	Peru	0.186	64
Denmark	0.311	40	Philippines	0.371	30
Dominican Republic	0.588	8	Poland	0.134	74
Egypt, Arab Rep.	0.504	15	Portugal	0.185	65
El Salvador	0.277	47	Romania	0.158	69
Estonia	0.695	4	Russian Federation	0.184	66
Finland	0.219	60	Senegal	0.355	35
France	0.099	77	Singapore	0.743	2
Germany	0.076	82	Slovak Republic	0.273	48
Honduras	0.409	24	Slovenia	0.235	55
Hong Kong, China	0.546	13	South Africa	0.113	76
Hungary	0.225	58	Spain	0.192	63
Iceland	0.465	19	Sri Lanka	0.318	39
India	0.154	70	Sweden	0.159	68
Indonesia	0.133	75	Switzerland	0.136	73
Iran, Islamic Rep.	0.389	28	Thailand	0.278	46
Ireland	0.284	44	Trinidad and Tobago	0.408	25
Israel	0.339	36	Tunisia	0.326	38
Italy	0.062	83	Turkey	0.140	72
Jamaica	0.706	3	Uganda	0.457	20
Japan	0.081	79	United Kingdom	0.081	80
Jordan	0.555	10	United States	0.046	84
Kenya	0.391	27	Uruguay	0.221	59
Kuwait	0.560	9	Venezuela,	0.356	33

Source: Briguglio and Galea (2003).