Chapter 2

A Vulnerability and Resilience Framework for Small States

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2.1 Introduction

This chapter presents a revised vulnerability/resilience framework, building on the work of Briguglio et al. (2009).[1] The chapter also revises and updates the economic vulnerability and economic resilience indices, the former associated with exposure to external shocks and the latter with policies that can enable a country to minimise or withstand the negative effects of such shocks. A number of policy implications are derived from the study presented in this chapter.

The economic characteristics of small states are well documented, and include (a) a very high degree of economic openness due to their dependence on exports and imports, mostly because of their small domestic markets and lack of natural resource endowments; (b) a high degree of export concentration, mostly due to their small economic size, leading to diversification constraints; and (c) high dependence on strategic imports, such as fuel and food. These factors are associated with economic vulnerability, as they render a country highly exposed to external shocks.

There are other characteristics of small states that pose economic disadvantages, but do not lead directly to economic exposure to external economic forces. These include limited ability to exploit economies of scale – mostly due to overhead-cost indivisibilities associated with small-scale operations – as well as limitations on the effectiveness of domestic competition policy, due to the ease with which a small market can be monopolised or dominated by a few firms.

In the case of small island states, there are additional economic disadvantages associated with high international transport costs and uncertainties relating to the delivery of industrial supplies, due to insularity and remoteness. In addition, many small island states are archipelagos, made up of dispersed islands, leading to further problems associated with transport and fragmentation of administrative arrangements. Some small island states are also prone to natural disasters and are highly vulnerable to climate change.

This chapter is organised in eight sections. Section 2.2, which follows this introductory section, discusses the concept of economic vulnerability with reference to the literature on the subject. Section 2.3 focuses on the concept of resilience and the juxtaposition of vulnerability and resilience, again discussed with reference to the literature. Section 2.4 and section 2.5 present revised vulnerability and resilience indices, building on Briguglio et al. (2009), using updated data and additional

components. Section 2.6 uses these indices in the context of a resilience framework, accompanied by an analysis of the results, including country comparisons. Section 2.7 puts forward policy proposals based on the implications of the vulnerability/resilience framework, while section 2.8 concludes the chapter.

2.2 Economic vulnerability

2.2.1 The meaning of economic vulnerability

The meaning of the word 'vulnerability' originates from its Latin root *vulnerare,* meaning 'to wound'. This etymology associates the word with exposure to damage or harm and with precariousness. The term 'economic vulnerability' when applied to a country is generally used to refer to that country's susceptibility to being harmed by external economic forces as a result of exposure to such forces.

In the literature on economic vulnerability and small states, there are two major stances regarding the advantages and downsides of economic vulnerability. Most authors dealing with this subject consider economic vulnerability to be a disadvantage. In the first published version of the vulnerability index, Briguglio (1995) argued that high vulnerability scores are undesirable because they measure the extent to which a country is exposed to harmful external shocks. That small economic size poses economic disadvantages is also a contention put forward by other authors including Atkins et al. (2000), Crowards (2000) and Turvey (2007). Cordina (2008) – referring to the criticisms posed by Baldacchino (2006) and Armstrong and Read (2003), who criticised the vulnerability paradigm on the grounds of irrelevance to actual economic situations and possible misspecification – contends that such criticism fails to sufficiently distinguish between economic vulnerability and lack of viability of a state. The author argues that an economy may still be viable and indeed successful in spite of its vulnerability if it develops appropriate response mechanisms, termed as 'economic resilience', as shown by the vulnerability–resilience framework developed by Briguglio et al. (2006).

In an earlier paper, Cordina (2004) argued that volatile growth is damaging and the downswings are not automatically compensated for by episodes of equal upswings, as the harmful effect of a given negative growth rate is not cancelled by an equally positive growth rate, basing his arguments on neoclassical theory of diminishing returns to factor inputs. This view is supported by Briguglio (2011), arguing that, in the real world, negative shocks lead to declines in real gross domestic product (GDP) from which it is difficult to recover, even when these are followed by positive growth rates – particularly if the downswings lead to malnutrition, disease and possibly deaths. Even in relatively advanced countries, GDP declines can lead to persistent unemployment through what is known as 'hysteresis'. Bishop (2012), overviewing the different stances regarding the vulnerability hypothesis, contends that small states can and do engage in a range of productive and highly profitable activities. Yet this does not alter the fundamental fact that they still remain intrinsically vulnerable. For this reason, Bishop argues that the retention of the concept of vulnerability, properly defined and understood, is essential in conceptualising the realities of small state development.

These views are contested by Armstrong and Read (2002), who refer to the evidence that the GNP per capita of small states tends to be higher, on average, than that of larger states. Armstrong and Read (2002) further attempt to show that the vulnerability index proposed in Briguglio (1995) correlates positively, not negatively, with GDP per capita and therefore the argument that vulnerable countries are disadvantaged does not 'hold water'. This argument was reiterated by Armstrong and Read (2003), who, while agreeing that small states do indeed face very serious challenges, argue that these states have developed strategies which have allowed them to successfully overcome such challenges. Baldacchino and Bertram (2009) assert that the argument that small states are 'vulnerable' is deterministic in that it associates such states with weakness. They also maintain that this argument is diplomatically driven, and is intended to seek generous development and diplomatic assistance from the international community in response to the so-called 'special needs' of small states. An influential paper that attempted to downplay the constraints faced by small states is authored by Easterly and Kraay (2000), who argue that the fact that many small states enjoy a higher per capita GDP than larger states can be explained in terms of the productivity advantage enjoyed by these states. The authors intimate that small states have perhaps received excessive attention from the literature, and therefore they should be treated in the same way as large states and receive the same policy advice as large states do. Other authors who seem to conclude that smallness is an advantage include Domeland and Sander (2007), who argue that small African countries tend to have stronger governance, more political stability, a lower incidence of state failure, less ethnic fractionalisation and lower occurrence of armed conflict than larger Sub-Saharan African countries.

Although the two major stances regarding the advantages and downsides of economic vulnerability would seem to be confrontational, the basic difference between the two viewpoints hinges on whether resilience building is automatically triggered in small economies or is a matter of policy choice. Baldacchino and Bertram (2009) and Armstrong and Read (2002) would seem to suggest that the economic vulnerability associated with small economic size automatically sparks off policies conducive to growth. In reality, there are many cases of small states that are highly vulnerable and badly governed economically, ending up in what Briguglio et al. (2009) call the 'worst case' scenario – which is characterised by high exposure to shocks and lack of resilience policies.

2.2.2 The vulnerability index

During the early 1990s, particularly within the United Nations system and the Commonwealth Secretariat, it was realised that the concept of vulnerability needed to be operationalised and measured in the form of an index relating to the extent to which economies were prone to harm by external shocks. Various vulnerability indices have been developed for this purpose and, in general, these indices indicate that small states, particularly island ones, tend to be more economically vulnerable than larger countries.[2]

Inherent versus policy-induced features

Since its earliest version (Briguglio 1992), the vulnerability index was an attempt to identify inherent features that are permanent or quasi-permanent, which lead to high exposure to external economic shocks, as distinguished from policy-induced measures. This approach was intentional to exclude any self-inflicted economic weaknesses. For example, in the case of small island developing states (SIDS), a small domestic market is an inherent feature, and this leads to high dependence on imports and exports, whereas inflation and public debt are policy-induced features, as these can be highly influenced by government measures. This argument was reiterated by Briguglio et al. (2009), who categorised policy-induced factors under the heading of resilience, which could mitigate or possibly exacerbate the harm from exposure to external shocks.[3]

Causes and manifestation of vulnerability

Briguglio (2004) argued that it is important to distinguish between the cause of the phenomenon that is to be measured and the manifestation of such a phenomenon. Thus, for example, with respect to economic vulnerability, one of the causes may be high dependence on international trade, whereas the manifestation could be export volatility. Variables representing the causes of the phenomenon are more suitable to measure that phenomenon than variables purporting to represent its manifestation. One reason for this is that a manifestation may have various causes – for example, export volatility may not be the effect of external shocks only, but could be highly influenced by internal policy measures. On the other hand, there may be instances where the volatility effects of vulnerability are not manifested. This occurs, for example, when vulnerability is mitigated by resilience-building policies, so that exposure to economic shocks would be counteracted by sound economic governance.[4]

Methodology of the Briguglio-type vulnerability index

Briguglio and Galea (2003), in constructing a vulnerability index, associated economic vulnerability with openness,[5] export concentration[6] and dependence on strategic imports.[7] In an earlier study, Briguglio (1995) included proneness to natural disasters as a factor associated with economic vulnerability.[8] The main advantages of the Briguglio-type economic vulnerability index (EVI), which according to Wang (2013) is the most prominent one in the literature on EVI design, are the ease with which it is understood and the ease of calculation it allows.[9]

The basic problem with the methodology utilised by Briguglio in his various studies on the EVI, and by other authors who have utilised a similar methodology, is that the variables, though carefully and judiciously chosen, were subjectively selected – so much so that Briguglio himself, Chander (1996), Wells (1996) and Crowards (1999, 2000a) experimented with various possible components.

Another criticism relates to the use of trade openness as an indicator of vulnerability. Briguglio, in his various studies on the EVI, argues that trade openness is an inherent feature of an economy. However, Guillaumont (2009) argued that trade openness is a policy-induced variable and is an indicator of the competitive strength of a country.

The counter-argument to Guillaumont's view is that, while export performance is indeed related to competitiveness, trade openness is a permanent feature of small states due to their small domestic market and limited resource endowments, and this is a source of exposure to shocks over which a country has no or very limited control.[10]

A common conclusion that emerges from most of the economic vulnerability indices described above is that small states, particularly island ones, tend to be more inherently economically vulnerable than other groups of countries, and this is in spite of the differences in the components and the approaches utilised.[11] It can therefore be said that in the literature there is a high degree of consensus in this regard. Cordina (2008) shows that seven out of the eight vulnerability indices that he reviewed had statistically significant positive correlation coefficients between country size and vulnerability scores, implying that in general the indices tend to agree that small countries are more economically vulnerable than larger ones.

2.3 Economic resilience

2.3.1 The meaning of economic resilience

'Economic resilience', as used in this chapter, refers to the extent to which an economy can withstand or bounce back from the negative effects of external shocks. As such, it can be considered as the obverse of economic vulnerability. The word 'resilience' originates from its Latin roots *resilire,* referring to the ability to rise again.

Briguglio et al. (2009) distinguished between economic resilience – which is developed and managed as a result of deliberate policy – and economic vulnerability, which is due to inherent features of the economy. The authors argued further that the term 'economic resilience' can be used in two senses, relating to the ability of an economy to (a) absorb the effects of external economic shocks and (b) counteract the harmful effects of such shocks. The ability of an economy to absorb external shocks is associated with the flexibility of an economy, enabling it to recover after being adversely affected by a shock. This ability will be severely limited if, for example, there are market rigidities. The ability of an economy to counteract shocks will be enhanced when the economy has room for manoeuvre, as is the case, for example, in a situation of a strong fiscal position, when policy-makers can utilise discretionary expenditure or tax cuts to counteract the effects of negative shocks.

2.3.2 Resilience-building policies

Briguglio et al. (2009) hypothesised that the economic resilience-building policies include those leading to:

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

Macroeconomic stability

Macroeconomic stability, or lack of it, is generally measured by variables that relate to disequilibrium, such as price changes, government fiscal deficit and debt, the current account of the balance of payments, unemployment and exchange rates. One manifestation of such disequilibria could be GDP volatility, leading to an unstable economy.

Briguglio et al. (2009), in associating macroeconomic stability with economic resilience, argued that stability is connected with the interaction between an economy's aggregate demand and aggregate supply. If aggregate expenditure moves in equilibrium with aggregate supply, the economy will be characterised by internal balance, as manifested by a sustainable fiscal position, acceptable price inflation and an unemployment rate close to the natural rate, as well as by an external balance, as reflected in the current account position of the balance of payments. These variables are highly influenced by economic policy and could be good indicators of an economy's resilience in withstanding adverse shocks.[12]

The macroeconomic stability component of the resilience index proposed by Briguglio et al. consisted of three variables, namely (a) the fiscal deficit-to-GDP ratio; (b) the misery index, made up of unemployment and inflation rates; and (c) the external debt-to-GDP ratio. Data for these variables were available for a reasonably wide set of countries spread over a spectrum of stages of development, size and geographical characteristics.

The government budget position 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.

Inflation and unemployment are associated with resilience or lack of it because, if an economy has low levels of unemployment and inflation, it is likely that adverse shocks would not impose significant welfare costs on it. In this sense, therefore, unemployment and inflation are associated with resilience of a shock-absorbing nature.

The external debt-to-GDP ratio was considered to be a good measure of resilience because a country with a high level of external debt may find it more difficult to mobilise resources in order to offset the effects of external shocks. Thus, this variable would indicate resilience of a shock-counteracting nature.

It should be emphasised again here that GDP fluctuations are the outcome of, among other things, two distinct factors, namely the inherent vulnerability of the economy to external shocks and the policy-induced measures to withstand or possibly exacerbate the effect of such shocks. It is therefore not a correct approach to take GDP fluctuations as an indicator of policy-induced resilience.

Market adjustment

As part of their resilience index, Briguglio et al. (2009) utilised an indicator of what they called 'market efficiency', measuring it by using the 'regulations' area of the Economic Freedom of the World Index (Gwartney and Lawson 2005).

The science of economics often views markets and their effective operation, through the price mechanism, as the best system for allocating resources and achieving economic growth. This does not, however, imply absence of government intervention in the provision of goods and services. It is generally accepted by economists that such intervention is warranted when markets fail to operate, such as in the case of public goods and externalities, and in the provision of services with a high degree of positive externalities, such as education, health and pensions (collectively called 'merit goods'). In addition, government intervention may be necessary to ensure that markets operate well, such as by enacting anti trust laws in the goods market and putting in place regulatory frameworks in the financial market.

Market efficiency requires flexibility so that demand and supply adjust to their equilibrium levels as rapidly as possible. Briguglio et al. (2009) argued that, 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 persist. Indeed, with very slow or non-existent market adjustment, resources will not be efficiently allocated in the economy, resulting in welfare losses associated with shortages, unemployed resources and unutilised capacity. These considerations have important implications for shock-absorbing resilience.

The effective operation of the price mechanism, leading to, though not necessarily ensuring, optimal use of resources, requires that prices reflect the true cost of resources and that prices are not distorted through monopolistic practices and/or other market imperfections. Secondly, and very importantly in the context of the present paper, there needs to be flexibility in the economy which would allow goods, services, labour and capital to respond to the price signals in the economy.

Duval and Vogel (2008) contend, with regard to market flexibility, that the economically more resilient countries are the ones that have made most progress on market reforms. For instance, countries with rigidities in wage adjustment hinder workers' reallocation towards productive jobs following an economic shock, thereby delaying the return of employment and output to their initial levels. They argue, on the basis of empirical work, that their analysis provides strong evidence that heavy regulation dampens the initial impact of shocks, but makes it more persistent. The authors conclude that, in general, the literature indicates that market rigidities tend to protract the slump following adverse shocks.

A factor that has been associated with abusive behaviour in a free market relates to the financial sector. Briguglio et al. (2009) did not adequately take into account the destabilising effects of financial markets in the resilience index they constructed. Ocampo (2008) argues that in recent decades there has been an increased exposure of the real sectors of many economies to financial markets. To withstand macroeconomic vulnerability – that is, to build their resilience in the face of external shocks – Ocampo proposed a combination of prudential regulations, the deepening of the domestic financial markets and policies to regulate capital flows.

Ocampo argues that monetary policy transmission channels affect the resilience of a country in the face of economic shocks. A factor that is associated with such

transmission mechanisms is the liberalisation of the financial market. As Ocampo further argues, appropriate regulatory frameworks are important in this regard, given the possibility of excessive risk-taking, particularly in times of business cycle upswings, as evidenced in the financial crisis of 2007–08. This requires a well-functioning and well-regulated banking sector.[13]

Political governance

Good governance is associated with the safeguarding of the rule of law and property rights, as well as the delivery of efficient public services, through an authority that uses mechanisms, processes and institutions to manage the country's affairs.[14] Briguglio et al. (2009) assumed that one of the pillars of economic resilience was good political governance. The authors measured the governance component of their resilience index by using the 'Legal System and Property Rights' area of the Economic Freedom of the World Index (Gwartney and Lawson 2005).

Briguglio et al. argued further that without good governance it would be more likely that adverse shocks would lead to economic and social chaos and unrest, thereby exacerbating the effects of economic vulnerability. On the other hand, good governance can strengthen an economy's resilience because external shocks would be better absorbed and counteracted in an atmosphere of predictable laws and credible policies.

Briguglio et al. (2009) also put forward an explanation of why the good governance component has been included alongside a market efficiency component in the resilience index. The market efficiency index emphasises the importance of freely and properly operating markets for allocative efficiency and, hence, relates to the ability of an economy to reallocate resources quickly and effectively following an economic shock. This neoliberal approach, which has been questioned recently with the market failures associated with the financial turmoil, is balanced by an emphasis on appropriate governance in order to foster economic resilience. Thus, the resilience index proposed by the authors considers properly functioning markets and a framework of appropriate governance as two essential aspects of economic resilience.

Social development

Briguglio et al. (2009) included a 'social development' component in their resilience index, and measured this component in terms of education and health, as measured by the non-income components of the Human Development Index (HDI).

They argued that social development and social cohesion are essential components of economic resilience, as these indicate 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. They assumed that social development and social cohesion are positively related,[15] as these are both associated with 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. The positive relationship between social harmony and macroeconomic stability is also proposed by Vandemoortele (2010).

Social development and social cohesion can be conducive to economic growth. According to Foa (2011), the reasons for this include the reduction of transaction costs – for example, in the case of violent conflict between different sections of society, the costs will include policing, crime prevention and private security services. Because these costs may be such as to render economic transactions unprofitable at the margin, some deadweight loss will inevitably occur. In addition, social development and social cohesion facilitate collective action, and this may generate positive externalities arising from collective action in the form of providing, monitoring and enforcing the provision of necessary public goods such as infrastructure, schooling or health. In addition, and most of all, there is a high cost to intergroup violence as a result of capital disaccumulation caused by the destruction of physical infrastructure, and the 'brain drain' (loss of human capital).

Environmental management

'Environmental management' may be defined as institutions, regulation, practices and other processes conducive to environmental conservation, protection and use of natural resources. In order to achieve this aim, governments have to put in place appropriate legislative, judicial and educational systems and foster economic and social arrangements, which collectively can be called 'environmental law and policy'.

The connection between environmental management and economic resilience can be explained in terms of the possible association between such management and the ability of an economy to recover, once hit by an external shock. The environment in many of its aspects is a public good and may generate negative externalities, which in turn are associated with market failure and therefore need to be regulated by the government or some other governance entity.

In addition, there is a clear connection between stability and environmental management through enforceable rules, economic instruments and education aimed at encouraging good environmental practices. This has specific connotations for economic resilience because, as argued in the section on macroeconomic stability, withstanding a downside external shock is likely to be more difficult under unstable conditions.[16]

Environmental management can also be connected with economic performance. According to the ECFIN (2004), the economy will function better when environmental regulation involves the definition and enforcement of property rights. Moreover, at the macro level, there may be economic gains due to growth of the eco-industry and the creation of green jobs, needed for environmental management. Furthermore, environmental governance may lead to the establishment of new markets for environmental technologies. These benefits are not always translated into increases in GDP, the indicator normally used to measure economic performance, as, for example, improved health and improved aesthetics are not included directly in the income flow, although these, nevertheless, have an economic value.[17]

Briguglio et al. (2009) did not include a component of environmental management in the resilience index that they computed, due to lack of data; however, they acknowledged that such management is an important contributor to economic resilience.

2.3.3 The resilience index[18]

The composite index proposed by Briguglio et al. (2009)

Using the indicators described in the previous section, with the exception of the environmental management index, Briguglio et al. (2009) constructed a resilience index for 86 countries. They used the max–min formula to rescale the variables and used a simple average to aggregate the scores. The authors found that countries with an advanced economy, notably the United States, Canada, Japan, Australia, New Zealand and a number of countries in Western Europe, registered high resilience scores. These countries have well-developed institutional economic, social and political structures and are countries where market forces predominate in resource allocation. There was a high degree of correlation between GDP per capita and countries' resilience scores.

Of interest is that a number of small states characterised by inherent high economic vulnerability registered relatively high resilience scores – a finding that the authors refer to in order to explain why small states can be economically successful in spite of (and not because of) their high exposure to economic shocks.

Net savings as a proxy for economic resilience

Another economic resilience index proposed by Baritto (2008) is based on net savings per capita in the countries examined. The author again defined economic resilience as the ability of a country to recover from shocks, but the author's focus was on the aftermath of a disaster. According to the author, net savings represent the available funds for a country to be invested in order to undertake the recovery of its capital stock. This approach implies that a country with low per capita net savings is less able to recover from a severe shock on its own than a country with high per capita net savings.

The author admitted this to be an indirect approach that should be considered only as a tentative estimate, but it has a number of advantages – including that it can easily be constructed using data available for a wide range of countries and that such data is updated regularly.

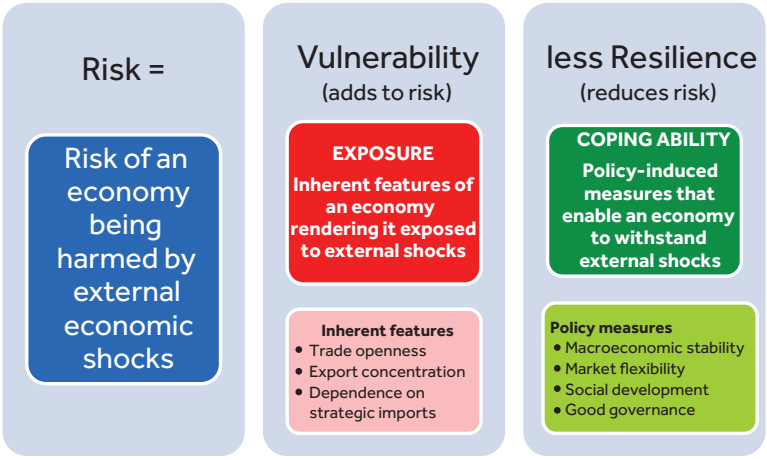
Baritto found that there was a close relationship between the resilience index constructed by Briguglio et al. (2009) and the per capita net savings as a proxy of resilience. The author contended that, although very different aspects are covered by those indicators, this relationship could be in part explained by the fact that both indices are strongly correlated with per capita income levels.

2.3.4 The vulnerability–resilience framework

By distinguishing between inherent economic vulnerability and nurtured economic resilience, Briguglio et al. (2009) created a methodological framework for assessing the risk of an economy being harmed by external shocks, as shown in Figure 2.1.

The figure shows that risk has two elements. The first is associated with vulnerability due to inherent conditions of an economy that is exposed to external shocks arising from trade openness, export concentration and dependence on strategic imports.

Figure 2.1 The risk of a country being harmed by external shocks



The second element is associated with policy measures leading to economic stability, market flexibility, social development and good governance.

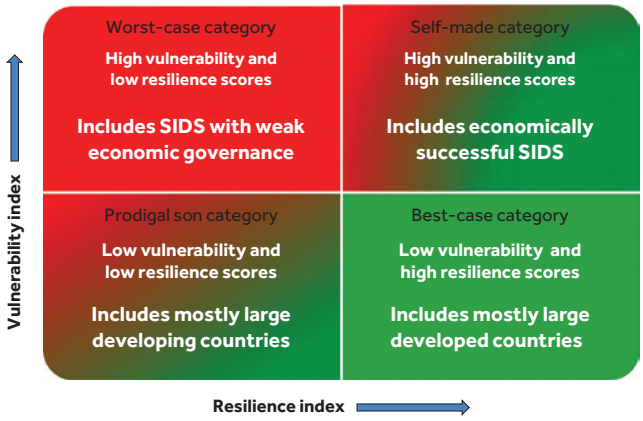
The risk of being adversely affected by external shocks is therefore the combination of the two elements, with the resilience element indicating that the risk would be reduced as resilience builds up.

By juxtaposing economic vulnerability and economic resilience, Briguglio et al. identified four possible scenarios into which countries may be placed according to their vulnerability and resilience characteristics, as shown in Figure 2.2. These four scenarios are termed '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 their inherent high vulnerability by adopting policies that run counter to economic resilience – and therefore exacerbate the effects of economic vulnerability. Highly vulnerable small states that are not well governed economically fall into this category.

Figure 2.2 The vulnerability/resilience nexus



Countries classified as 'self-made' are those with a high degree of inherent economic vulnerability, but which build up their economic resilience through the adoption of appropriate policies that enable them to cope with or withstand the effects of their inherent vulnerability. A number of small states – including Malta, Mauritius and Barbados – fall into this category.

Countries falling within the 'prodigal son' category are relatively large countries – and therefore with a relatively low degree of inherent economic vulnerability – that adopt policies deleterious to economic resilience, thereby exposing them to the adverse effects of shocks.

In Figure 2.2, the vertical axis measures inherent economic vulnerability and the horizontal axis measures nurtured resilience. Given that vulnerability refers to inherent characteristics that render countries prone to exogenous shocks, vulnerability scores for a particular country should not differ much over time. Therefore it is not expected that a country will move vertically along the quadrants of Figure 2.2, but horizontal movement is possible for those countries that adopt measures that 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.

Briguglio et al. (2009) use the scores of the vulnerability index produced by Briguglio and Galea (2003) and the resilience index produced in that same study, to place different countries into the four scenarios described above. By and large, countries with scores falling in the best-case quadrant were mostly the large 'developed countries', countries with scores falling in the 'self-made' quadrant include a number of small states with high vulnerability scores, countries in the prodigal son quadrant include mostly large developing countries, and countries in the worst-case quadrant include vulnerable small countries with weak economic governance.

According to Briguglio et al., this method of defining vulnerability in terms of inherent features and defining 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 exercise practically no control and which 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. 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.

2.4 A revised and updated vulnerability index

2.4.1 Added variables and extended discussion

The vulnerability and resilience framework proposed in this section draws on Briguglio et al. (2009) with some revisions, including that the study presented

in this chapter (a) covers many more small states; (b) includes an environmental management component[19] in the resilience index; (c) utilises updated data; and (d) includes a financial risk indicator.

2.4.2 The components of the vulnerability index

The vulnerability index proposed in the study presented in this chapter has four components, namely (a) trade openness; (b) export concentration; (c) dependence on strategic imports; and (d) proneness to natural disasters.[20]

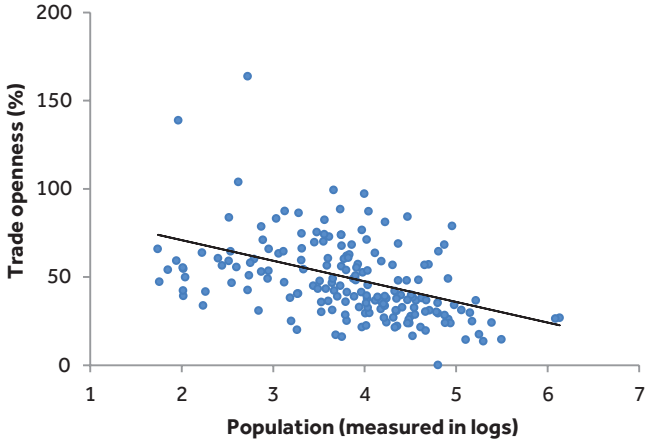
As already explained, the trade openness component is included in the economic vulnerability index on the assumption that, the higher the dependence of a country on international trade, the higher is the exposure to external economic shocks. This tendency is exacerbated when a country depends highly on a few export items. The 'dependence on strategic imports' variable is also included on the assumption that dependence on such products intensifies the exposure to external economic shocks arising from trade openness. The 'proneness to natural disasters' component is included because such disasters are also assumed to exacerbate the effects of external economic shocks and themselves lead to economic shocks.[21]

Measuring trade openness

In the study presented in this chapter, trade openness is measured by the average of exports and imports of goods and services as a percentage of GDP, averaged over three years (2009–2011). The sources of the data are presented in Appendix 2.1b(i) and its rescaled values are presented as Appendix 2.1a. As already explained, this indicator has been used in other vulnerability indices. In general, smaller countries tend to be more economically open than larger ones, as can be seen from Figure 2.3.

Figure 2.3 shows the relationship between population size of countries, measured in logs,[22] and trade openness, which, as the fitted line shows, tends to be negatively related.[23] As already indicated, the main reason for this tendency is that these states

Figure 2.3 Trade openness (%, vertical axis) and country size



have a small domestic market and are therefore compelled to seek larger markets. In addition, their lack of natural resource endowments leads them to depend highly on imports.

Measuring export concentration

In the present study, export concentration is measured by the sum of the three broad groups of exports of goods and services, which together take the highest percentage of total exports of goods and services. This is then expressed as a percentage of total exports of goods and services. The procedure used is explained in Appendix 2.1b(ii). The variables were averaged over three years, 2009–11. The sources of the data are presented as Appendix 2.1b(ii) and its rescaled values in Appendix 2.1a. A similar indicator was used by Briguglio (1997) and Briguglio and Galea (2003), but this approach is not commonly used in vulnerability indices, as most studies utilise the merchandise export concentration index compiled by UNCTAD.[24] An important shortcoming of the UNCTAD index is that it covers merchandise only, whereas in reality export concentration can be in exports of services, such as tourism and financial services. This is especially important for small states.

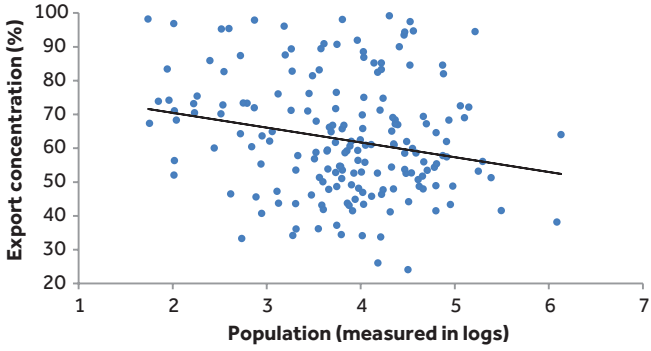
Figure 2.4 shows the relationship between country size, again measured by the log of the country populations and export concentration, measured as indicated above.

It can be seen from Figure 2.4 that export concentration and country size are negatively related, although here again there is considerable variation around the trend.[25]

Measuring dependence on strategic imports

Strategic imports refer to essential products, which tend to be price and income inelastic; therefore demand for such products does not decrease enough to compensate for income decreases. There are obvious vulnerability connotations when a country depends heavily on imported energy sources for production and on imported food for consumption.

Figure 2.4 Export concentration and country size



For the purpose of the present study, this variable will be measured by the imports of food and fuel as a percentage of total merchandise imports. Figure 2.5 shows the relation between this variable and population size of countries measured in logs. The sources of the data are presented in Appendix 2.1b(iii) and its rescaled values in Appendix 2.1a.

The figure indicates that small countries tend to be more dependent on strategic imports than larger ones, although here again there are considerable variations around the fitted line.[26]

Measuring proneness to natural disasters

An indicator capturing proneness to natural disasters has been used in various vulnerability indices, including Briguglio (1995) and Atkins et al. (2000). However, it has been left out in Briguglio and Galea (2003) and Briguglio (1997) on the grounds that it is not really an index of exposure to external economic shocks. On the other hand, it can be contended that natural disasters exacerbate the downside effects of external economic shocks and they do generate economic shocks themselves.

A commonly used source of data on such disasters is the EM-DAT database,[27] which was used in the study presented in this chapter, utilising the indicator relating to damage caused by disasters as a percentage of GDP over a period of about three decades (1980 to 2012). The relevant data is presented as Appendix 2.1a. Figure 2.6 shows that there is a negative relationship between the economic damage of natural disasters (on the vertical axis) and country size, measured by the log of the population (on the horizontal axis).[28]

The diagram shows that many countries experienced no or negligible natural disasters, and that the greatest extent of damage tended to occur in small states. The greatest damage during the period under consideration occurred in Samoa. Other small island states that experienced a relatively high degree of damage were St Lucia, St Kitts and Nevis, Haiti, Grenada, Vanuatu, Dominica, and Antigua and Barbuda.

Figure 2.5 Dependence on strategic imports and country size

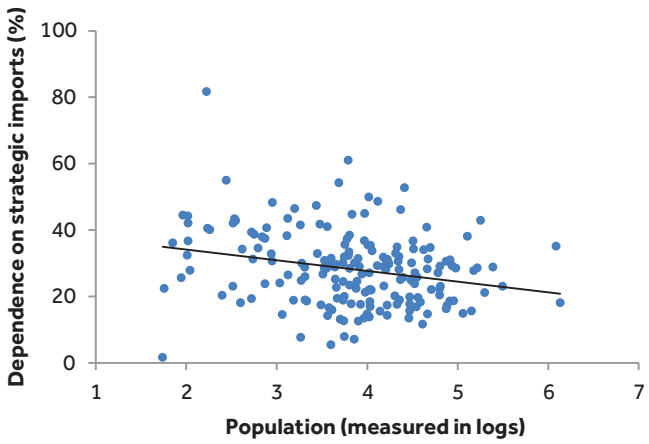
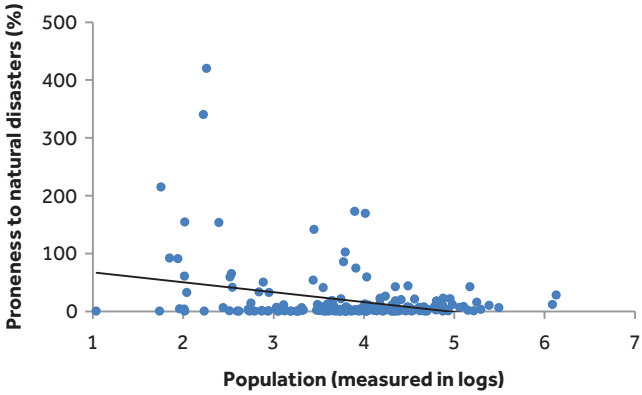


Figure 2.6 Proneness to natural disasters and country size



Other possible components of the EVI

As indicated in the discussion on vulnerability indicators, there are many other variables that were used to construct an economic vulnerability index. As argued, the authors have utilised only variables that reflect permanent or quasi-permanent features of an economy that render it exposed to external shocks.[29]

2.4.3 Constructing a vulnerability index

The data relating to the four components of the vulnerability index were rescaled using the max–min formula, as presented in Appendix 2.1, which also gives the sources of the data. Figure 2.7 summarises the weighting scheme of each component of the index, where, as can be seen, a 25 per cent weight is assigned to the four components described above.[30]

Figure 2.8 shows the relationship between the scores of the vulnerability index (on the vertical axis) and country size, measured in terms of the log of the population size

Figure 2.7 Components and weighting scheme of the economic vulnerability index

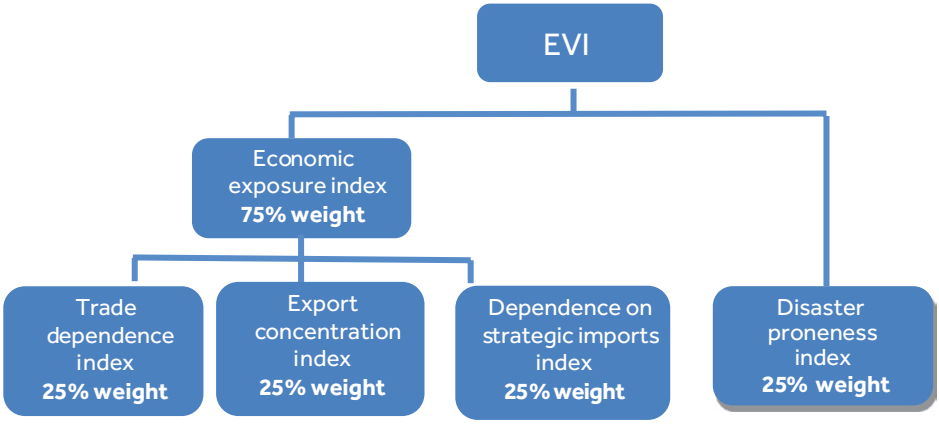
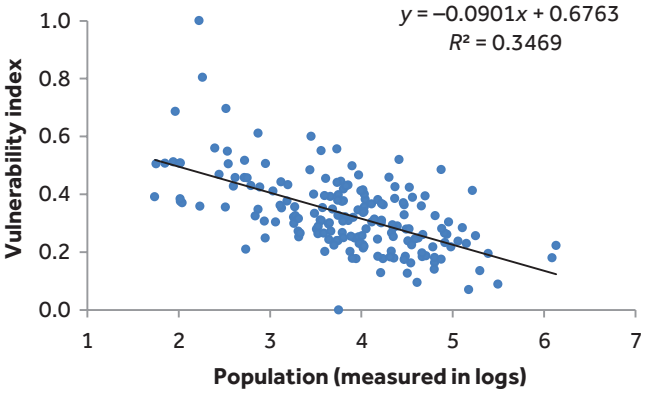


Figure 2.8 The vulnerability index and country size



(on the horizontal axis).[31] As can be seen from the diagram, there is a clear negative relationship between the two variables, although there is considerable variation around the fitted line.[32]

This tendency can also be observed from the data presented in Appendix 2.1, where the majority of highly economically vulnerable countries are small island states, with relatively high scores with respect to all or most components of the vulnerability index. Conversely, the least vulnerable countries are mostly large ones, with relatively low scores with respect to all or most components of the vulnerability index.[33]

2.5 A revised and updated resilience index

2.5.1 The components of the resilience index

The resilience index proposed in this chapter has five components, namely (a) macroeconomic stability; (b) market flexibility (adjusted for financial riskiness); (c) political governance and institutions; (d) social development; and (e) environmental management.

It should be noted that the resilience index proposed here, unlike the resilience index developed by Briguglio et al. (2009), will contain an environmental management component. In addition, the market flexibility component of the index this time will include considerations relating to financial riskiness.

2.5.2 Measuring macroeconomic stability

Policy-induced variables associated with macroeconomic stability

For the purpose of the study presented in this chapter, the macroeconomic stability component of the resilience index will consist of the following three components:

- *Government debt as a ratio of GDP*. This variable captures instability in government finances through cumulative fiscal deficits. As explained above, this variable was also used by Briguglio et al. (2009),[34] who argued that it is associated with resilience because a country with a low level of debt may find it easier to

mobilise resources in order to offset the effects of external shocks. Thus, this variable would indicate resilience of a shock-counteracting nature.

- *Inflation*. This variable can be measured by either consumer prices (such as the retail price index) or the GDP deflator. In this study the GDP deflator was used, as it was considered more appropriate than a consumer price index to capture the incidence of excess demand or supply in the macroeconomy, given that the former index excludes imported inflation. Inflation provides additional information to that contained in the government debt variable because it is strongly influenced by other types of economic policy, including monetary policy. This variable is associated with resilience because, if an economy already has high levels of inflation, it will have limited room for manoeuvre in the event of an adverse external shock.
- *Deficits on current account of the balance of payments as a ratio of GDP*. This variable measures imbalances in external transactions. It also relates to domestic savings[35] and changes in external reserves.[36] It is associated with resilience because, if an economy is suffering from chronic current account deficits, it will not have room for manoeuvre in the face of adverse shocks.[37] This variable was not included in the resilience study of Briguglio et al. (2009), but was included by Briguglio and Piccinino (2012) in a study of resilience in East Asia.

These variables are measured as an average over a ten-year period (2003–12), to reduce as much as possible the effects of cyclical fluctuations. The data for these three variables were derived from the IMF's World Economic Outlook Database[38] and the way they were measured is explained in Appendix 2.2b(i). To obtain the 'macroeconomic stability' index, its components were rescaled using the max–min formula.

Figure 2.9 shows the relationship between the 'macroeconomic stability' index and its components (on the vertical axis) and country size, measured by the log of the population (on the horizontal axis). To obtain the 'macroeconomic stability' index, its components were rescaled using the max–min formula.

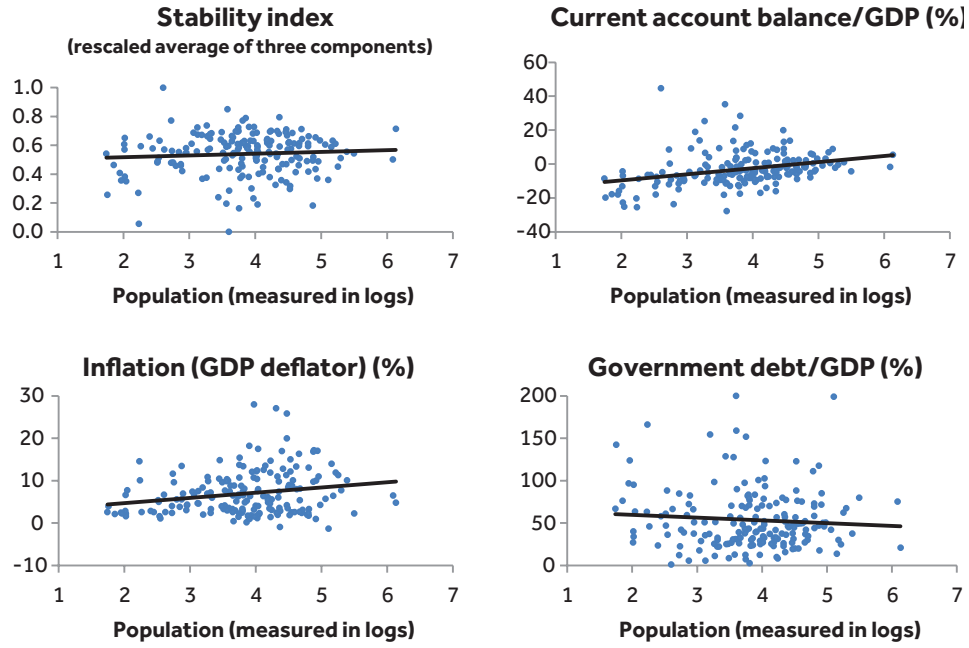
It can be seen from the fitted lines that (a) the incidence and magnitude of current account deficits (negative values) tend to be higher in smaller states; (b) inflation tends to be lower in smaller states; (c) debt tends to be higher in smaller states; and (d) the 'macroeconomic stability' index, which comprises the aforementioned three indices, shows a slight tendency to increase with changes in the size of countries, as indicated by the fitted line.[39] However, here again there are considerable variations around the fitted line, with smaller and larger states both registering high and low degrees of instability.

2.5.3 Measuring market flexibility

Economic Freedom of the World Index

Indicators of market flexibility that span a sufficiently wide range of countries – as required for the purpose of the study presented in this chapter – are not readily

Figure 2.9 The stability index and its components against country size

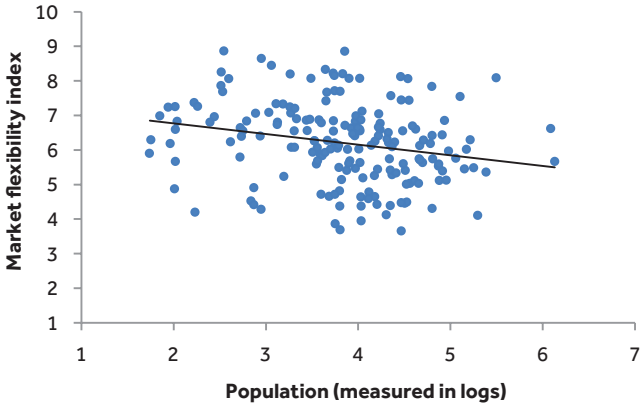


available. Following a search for suitable indicators, it was decided to use the two indices from the fifth component of the Economic Freedom of the World index (EFWI), titled 'Regulation', which measures the extent to which markets operate freely, competitively and efficiently across countries.[40] It is designed to identify the effect of regulatory restraints and bureaucratic procedures on competition and the operation of markets. Each component and subcomponent of the EFW Index is measured on a scale ranging from 0 to 10, reflecting the distribution of the underlying data.

The 'regulation' major area of the EFWI has three components and various subcomponents. The three main components are (i) credit market regulations; (ii) labour market regulations; and (iii) business regulations (Gwartney et al. 2013).[41] For the purpose of the 'market flexibility' index the authors use the second and third components. An indicator relating to the financial market will also be used, as explained in the next subsection.

In the case of the labour market component of the EFWI,[42] inflexibility relates to market interference such as that related to unduly high unemployment benefits (which could undermine the incentive to accept employment), dismissal regulations, minimum wage impositions, centralised 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. In the present study, a country would have a higher market flexibility score if it allowed market forces to determine wages and establish conditions of dismissal, and refrained from the use of conscription.

Figure 2.10 Market flexibility index and country size



The 'business regulations' index[43] relates to bureaucratic control of business activities, which is also thought to inhibit market flexibility. 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 capacity of freely operating markets to absorb shocks.

The 'market flexibility' index is obtained by combining the 'labour market regulations' index and the 'business regulations' index, for the years 2009–2011, covering 152 countries. The result indicates that a number of smaller states are among the top ten least regulated countries, including Hong Kong, Singapore, The Bahamas and Bahrain. However, there are some small states that are heavily regulated.

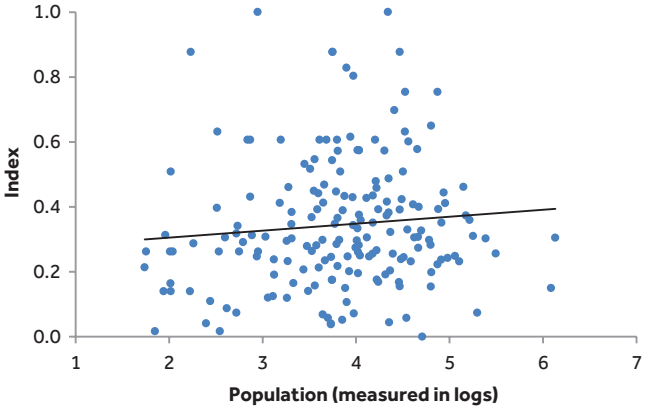
The EFWI leaves out a number of small states, and this renders it somewhat deficient for the purpose of the study presented in this chapter.[44] The missing country data were filled in by resorting to the World Bank's Doing Business Index (DBI), given that the EFWI draws heavily on the DBI. The procedure for obtaining the missing data is explained in Appendix 2.2b(ii). The resulting 'market flexibility' index is presented in Appendix 2.2a.

Figure 2.10 shows the relationship between the 'market flexibility' index plotted against country size, measured by the log of the population (on the horizontal axis). It can be seen that there is a slight tendency for small states to have more flexible markets, as indicated by the fitted line, although, as in the case of other resilience variables considered in this study, the correlation is very weak.[45]

Financial riskiness index

As explained above, the free market has been associated with excessive riskiness in the financial markets – and this has negative resilience implications. For this reason it was decided to combine the 'market flexibility' index, which relates to the market for labour

Figure 2.11 Lack of financial prudence index and country size



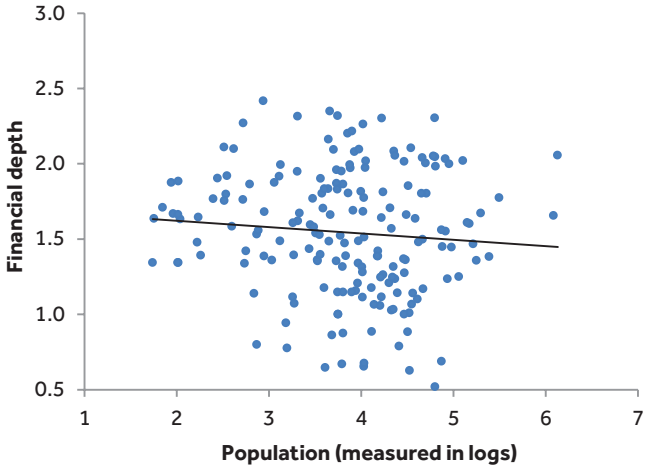
and goods, with a 'financial riskiness' index, the latter consisting of two components, namely (i) 'lack of financial prudence' weighted by (ii) the 'importance of the financial sector'. The assumption here is that, if we take two countries with an equally high 'lack of financial prudence' score but the first has a larger financial sector than the second, the problem will be higher in the first country than in the second.

To measure 'lack of financial prudence' it was deemed appropriate to derive the information from two indices utilised in the Global Competitiveness Indicators (Schwab 2013) titled 'soundness of banks' and 'regulation of securities exchanges', suitably adjusted and rescaled using the max–min procedure. The method used for this purpose is explained in Appendix 2.2b(iii). This index again leaves out a number of small states from its coverage. The missing country data were obtained from the World Bank's 'strength of legal rights' index, which has an extensive country coverage.[46] The procedure used for this purpose is again explained in Appendix 2.2b(iii) and the resultant 'lack financial prudence' index is presented as Appendix 2.2a. The relation between 'lack of financial prudence' and country size is shown in Figure 2.11, which suggests that small states as a group tend to be more financially prudent than larger states, but the correlation coefficient, here again, is very low.[47]

As already explained, the 'lack financial prudence' index was weighted by another index that measures the 'depth of the financial sector' in an economy. Here again it was found somewhat difficult to identify an index that exactly fits this purpose. The best available index in this regard, with sufficient 'small state' coverage, was the 'bank private credit to GDP (%)' index, which relates to the financial resources provided to the private sector by domestic banks and other financial institutions. According to the World Bank (2012, 23), this index provides a good estimate of the depth of the financial sector. Appendix 2.2b(iii) presents an explanation of how the 'financial depth' index was constructed.

The correlation between financial depth and country size, shown in Figure 2.12, indicates that the correlation between the two variables is very weak, suggesting that there is no statistical evidence that small states differ significantly from larger states with regard to financial depth.[48]

Figure 2.12 Financial depth and country size

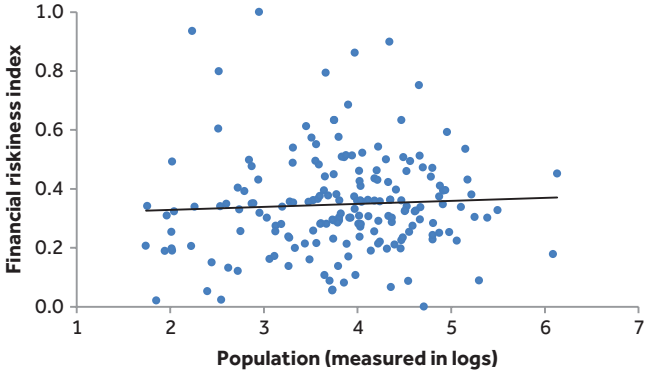


The 'lack of financial prudence' and 'financial depth' indices were combined to construct a 'financial riskiness' index. This index is presented as Appendix 2.2a. It should be noted that these two indices together are intended to measure confidence (or lack of it) in the financial sector and the importance of this sector, which are desirable attributes for assessing resilience, as suggested by Ocampo (2008).

Figure 2.13 shows the relation between the financial riskiness index, rescaled using the max–min formula, and country size, measured by the log of the population (on the horizontal axis).

It can be seen that the fitted line is almost horizontal,[49] indicating that financial riskiness is not significantly associated with country size, the reason being that, as shown, larger countries as a group tend to lack of financial prudence to a higher degree than smaller countries, but small countries tend to have a larger financial sector. However, there are wide variations around the trend, and individual countries within each group have their own particular circumstances.

Figure 2.13 Financial riskiness index and country size



As can be seen, the construction of the 'financial riskiness' index required a somewhat complicated procedure, and the validity of this index is likely to be questioned as a result of the manner in which the missing data was estimated. However, the alternative approach was to leave out this index, which was not considered desirable given the lessons learned from recent developments in global financial markets. The main message that the authors intend to convey by this index is that riskiness is often 'perceived' and a perception index, such as the one used in this study, is therefore appropriate. In addition, such risk is heightened as the financial sector increases in importance.

The 'adjusted' market flexibility index

The 'adjusted market flexibility' index is a combination of (a) the 'market flexibility' index in the labour and goods markets (MFX) and (b) the 'financial safety index' measured as 1-FNR, which is the obverse of the 'financial riskiness' index.[50] Following due consideration, it was decided to construct the 'adjusted market flexibility index' by assigning 75 per cent weight to 'market flexibility' and 25 per cent weight to 'financial safety'. The resultant data are presented in Appendix 2.2.[51]

Figure 2.14 shows the relationship between the 'adjusted market flexibility' index (rescaled using the max–min procedure, on the vertical axis) and country size, measured by the log of the population (on the horizontal axis).

It can be seen that there is a tendency for small economies to be more flexible than larger countries after adjusting for financial riskiness, although here again the correlation is weak.[52] This indicates that there are many exceptions, with a number of small states registering low flexibility scores and a number of large states registering high flexibility scores.

2.5.4 Measuring political governance

The Worldwide Governance Indicators

In order to measure political governance, which, as argued above, is an important requisite for resilience building, the present study utilises the Worldwide Governance Indicators (WGI).[53] These indicators have six dimensions of governance, namely (i) voice and accountability; (ii) political stability and absence of violence;

Figure 2.14 'Adjusted' market flexibility index and country size

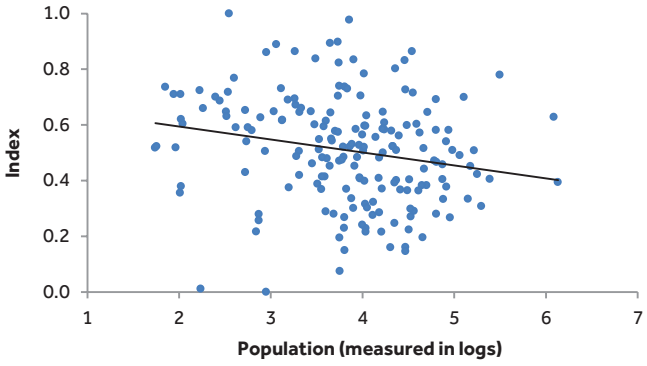
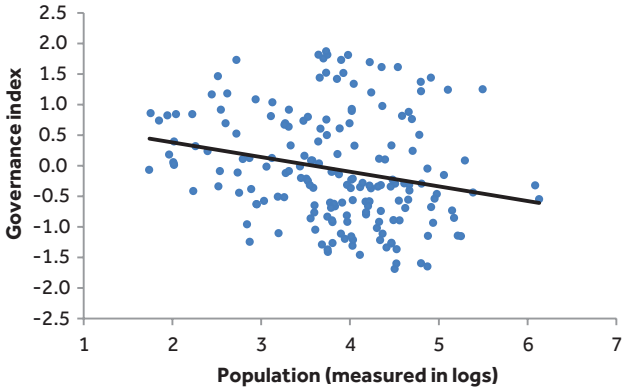


Figure 2.15 Political governance index and country size



(iii) government effectiveness; (iv) regulatory quality; (v) rule of law; and (vi) control of corruption. The indicators are based on the views of persons involved in business, ordinary citizens and expert surveys, with sources derived from various institutes, think tanks, non-governmental organisations, international organisations and private sector firms. The data was rescaled using the max–min approach to render the data comparable across sources. A detailed description of the methodology is given by Kaufmann et al. (2010). The data used for the purpose of the present study was averaged over the six dimensions of the WGI indicators and again averaged over three years (2009, 2010 and 2011). The data relating to the WGI and the data sources are presented in Appendix 2.2a.

Figure 2.15 shows the relationship between the scores of the components of the WGI (on the vertical axis), ranging from –2.5 (worst governance score) to +2.5 (best governance score) and country size (on the horizontal axis), measured by the log of the population.

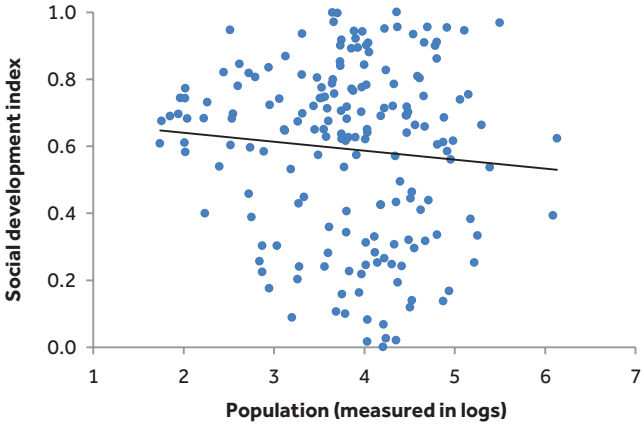
The fitted line indicates that there is a tendency for small states to register higher governance scores than large countries, but here again the highly dispersed scatter markers indicate that the correlation is poor.[54]

2.5.5 Measuring social development

The social components of the Human Development Index (HDI)

The study presented in this chapter utilises the non-income components of the Human Development Index as an indicator of social development.[55] The HDI is a widely used index, having the advantage of covering a large number of countries. Its non-income components relate to education and health. Education is measured by (a) mean years of schooling[56] and (b) expected years of schooling,[57] while health is measured by life expectancy at birth.[58] These indicators measure the countries' average achievement in terms of these important social features. The resilience index produced by Briguglio et al. (2009) utilised these two indices as indicators of social development, as this was considered superior to other social indices, as explained below.

Figure 2.16 Social development index and country size



The data relating to the social components of the HDI and the sources of the data are presented in Appendix 2.2a and 2.2b(vi). Figure 2.16 shows the relationship between the rescaled scores of the non-income components of the HDI (on the vertical axis) and country size, measured by the log of the population (on the horizontal axis).

It can be seen that there is a tendency for small states to register higher scores than larger states, but the correlation is very low, as evidenced by the spread of the scatter markers around the fitted line.[59]

2.5.6 Measuring environmental management

Environmental indicators

In order to cater for environmental governance in the economic resilience index, it is important to distinguish between the different objectives of environmental indicators. Some sets of indicators are intended to capture the state of the environment, including natural and inherent features, such as earthquakes, volcanoes, droughts and floods. These are referred to as 'state' indicators, as their focus is on the condition of the environment. Other indicators measure anthropogenic pressures, such as industrial pollution. Still other indicators refer to policy responses to the state of the environment and anthropogenic pressure. For the purpose of this study, the relevant indicators are those associated with policy responses that are conducive to environmental governance.

The environmental performance index

This study utilises the environmental performance index (EPI) as an indicator of environmental governance.[60] The EPI attempts to quantify and numerically benchmark the environmental performance of a country's policies. Each component of the EPI represents policy categories, each of which is assigned a weight in order to construct an aggregate score. According to the information given in the EPI website,[61] the weightings at all levels of aggregation take into consideration the underlying

variability in the data, the quality of the datasets and current policy priorities, to produce a balanced EPI score, based on expert judgement.[62]

The 2012 EPI ranks 132 countries in the following ten policy categories: (a) environmental burden of disease; (b) water (effects on human health); (c) air pollution (effects on human health); (d) air pollution (ecosystem effects); (e) water resources (ecosystem effects); (f) biodiversity and habitat; (g) forests; (h) fisheries; (i) agriculture; and (j) climate change. These policy categories were grouped into two broad policy objectives, namely (i) environmental health (EH), which measures environmental stresses to human health, covering the first three policy categories; and (ii) ecosystem vitality (EV), which measures ecosystem health and natural resource management, covering the remaining seven policy categories. The EH objective was given a weight of 30 per cent, while the EV objective was given a weight of 70 per cent. These policy objectives and categories are further subdivided into 22 performance indicators. The EPI website presents a detailed description of each indicator used in the EPI.[63]

Choice of the EPI as the environmental indicator for the resilience index

The only set of indicators that is highly focused on environmental governance and that has recently been updated is the environmental health index of the EPI. However, the index does not have a sufficiently good coverage of small states. Nonetheless, the authors decided to still use this index, by extrapolating the existing data to derive values for missing country data.

The following method was used to fill the data gaps:

(a) A 'least squares' multiple regression procedure were used to determine what explanatory variables systematically affected the 'environmental health' (EH) index for the countries for which data for this index was available. It was ensured that these explanatory variables were also available for all countries, including those with missing EH scores. The estimated coefficients were then used to estimate the EH index for the countries with missing data, using the mentioned explanatory variables.

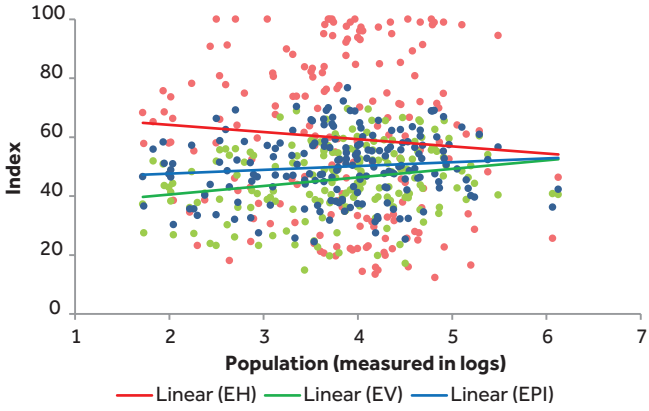
(b) The same procedure was applied to estimate the 'ecosystem vitality' (EV) index for the countries with missing data.

(c) The estimates of EPI for the countries with missing data were obtained by weighting the estimated EH by 0.3 and the estimated EV by 0.7, the method used by the authors of the EPI index.

The procedure for estimating the missing data is further explained in Appendix 2.2b(vii) and the results are presented in Appendix 2.2a. Figure 2.17 shows the relationship between the scores of the EH, EV and EPI indices (on the vertical axis) against country size, measured by the log of the population (on the horizontal axis).

It can be seen from Figure 2.17 that small states, compared with larger countries, tend to have higher scores for the EH index, which measures environmental stresses to human health. On the other hand, the fitted line of the EV index, which measures ecosystem health and natural resource management, slopes in the opposite direction,

Figure 2.17 Environmental performance index and country size



indicating that small states tend to have weaker natural resources management than larger ones.

The EPI, which is a weighted average of the EH and EV indices, also slopes upwards, being mostly influenced by the EV index with a weight of 70 per cent, suggesting that environmental performance tends to be better in larger countries, although the slope is very low and almost horizontal. Again the scatter markers indicate that the correlation is weak.[64]

2.5.7 Resilience index components

The five variables discussed above were grouped into three components of the resilience index, as follows:

(i) macroeconomic stability;

(ii) market flexibility, adjusted for excessive financial risks; and

(iii) governance, consisting of political governance, social development and environmental management (the reason these three aspects of governance were grouped together is that there is likely to be a degree of overlap between these indicators).

Figure 2.18 shows the organisation of the index and the weighting scheme.[65]

2.5.8 Economic resilience index (ERI)

The scores of the composite resilience index are presented in Appendix 2.2b(viii) and will be discussed further below. Here the authors only describe general tendencies with regard to the relationship between the ERI and country size, as shown in Figure 2.19.

It can be seen that there is a tendency for smaller states to exhibit a higher degree of economic resilience than larger states. However, this need not imply that there is causality between size of countries and resilience, given the extremely low correlation

Figure 2.18 The components and weighting scheme of the environmental resilience index (ERI)

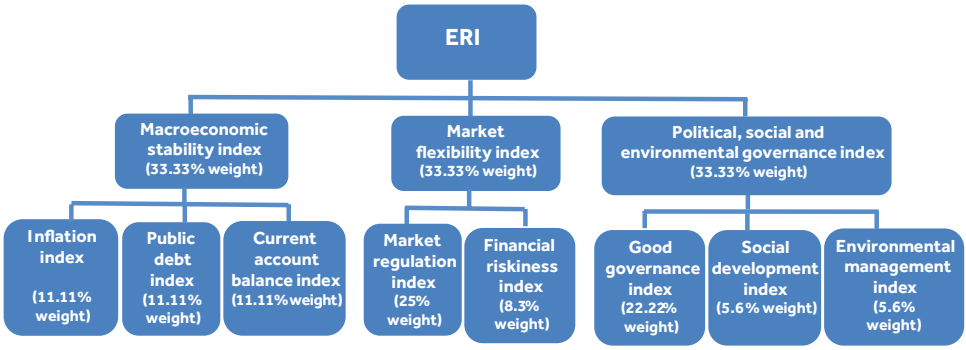
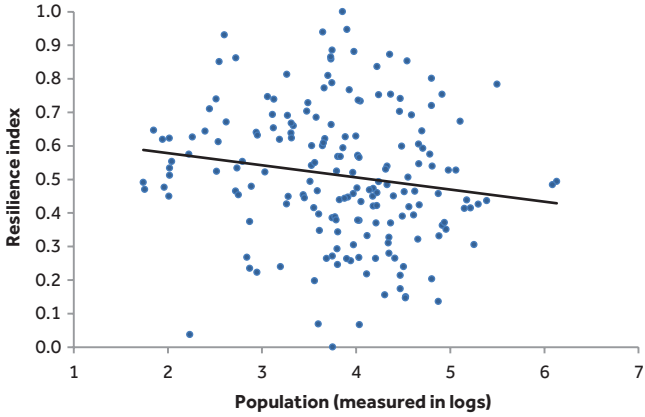


Figure 2.19 The economic resilience index and country size



coefficient. There is, however, a high degree of correlation between the ERI and GDP per capita.[66] This would seem to indicate that the most resilient countries tend to be economically developed ones. Most developing countries are relatively large ones and this may explain the backward bending line of Figure 2.19.

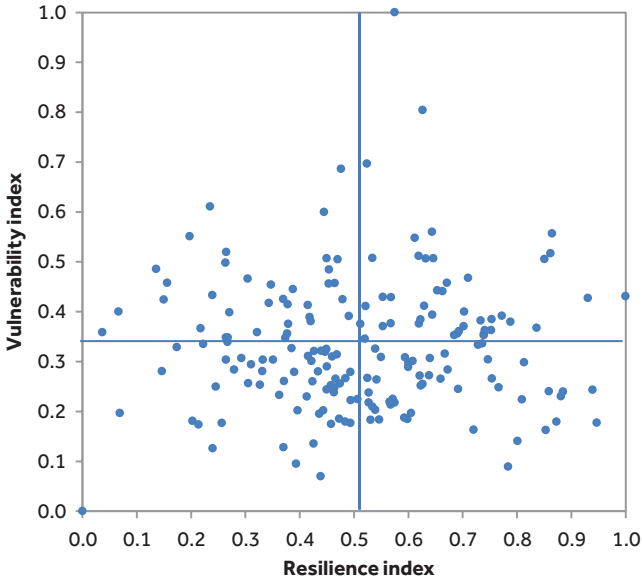
2.6 The revised vulnerability/resilience framework

2.6.1 Juxtaposing vulnerability and resilience

The resilience index and the vulnerability index were rescaled again using the max–min formula and juxtaposed, to classify countries in terms of the two indices, and to populate the vulnerability and resilience nexus diagram, shown in Figure 2.3 above.

It can be seen that the country scores, represented by the blue markers in Figure 2.20, occupy the four quadrants of the diagram, with countries registering varying vulnerability and resilience scores. The boundaries of the quadrants were set as the average score of each of the two indices.[67] However, as will be explained below, there are many borderline cases.

Figure 2.20 The vulnerability and resilience scores, juxtaposed



2.6.2 Country comparisons

The countries covered by the EVI and ERI can be grouped into four categories, as shown in Table 2.1. This table can be considered as the hypotheses to be tested by the results of classification of countries, based on the vulnerability and resilience indices computed for the purpose of the study presented in this chapter.

The actual names of the 183 countries in each category, based on the vulnerability and resilience indices developed in the present study, are listed in Table 2.2.[68]

Generally speaking, the countries shown in the first and third column of Table 2.2 correspond with the expected classification hypothesised in Table 2.1. However, there are a few exceptions. There are a few larger states included in the high-vulnerability and low-resilience category, namely Iraq, Libya, Nigeria, Tajikistan, Turkmenistan and Ukraine, characterised by relatively high export concentration. The high resilience and high vulnerability category, which was expected to include small,

Table 2.1 Expected type of countries in the four categories

Category of countries		Expected type of countries in this category
Vulnerability score	**Resilience score**	
Low	High	Large developed countries with good economic governance
Low	Low	Large developing countries with weak economic governance
High	High	Small states with good economic governance
High	Low	Small states with weak economic governance

well-governed states, includes Chile, Korea, Hungary and Saudi Arabia, which also registered relatively high scores in export concentration or openness.

It should be noted here that there was a degree of subjectivity in the classification of countries in the borderline cases. The countries were placed in that category after examining their 'economic resilience' score. For example, the countries in the second cell of the top row of Table 2.2 registered higher resilience scores than those in the first cell of the same row. Likewise, the countries in the second group of the lower row of Table 2.2 registered higher resilience scores than those in the first cell of the same row.

The classification of countries in Table 2.2 is best viewed as providing general tendencies, in line with the hypotheses presented in Table 2.1, which, as already noted, are by and large confirmed on the basis of available data.

The country classification depends on the underpinning assumptions

The classification of countries shown in Table 2.2 depended highly on many underpinning assumptions, including those relating to the validity of published data and their comparability across countries; the definitions and the measurement of the components; the weighting schemes; and the thresholds used for the four country categories. It is likely that alternative assumptions would yield alternative classifications. However, as stated, the methods proposed in the present study would seem to by and large support the hypothesis presented in Table 2.1.

2.7 Policy implications

2.7.1 Uses of the vulnerability and resilience indices

The vulnerability and resilience indices developed in this study, and their juxtaposition, may be useful to support decision-making in small states, especially for setting directions and justifying choice of priorities for resilience building. In particular, the analysis could help to:

- disseminate information on and draw attention to issues relating to resilience building;
- encourage quantitative estimations of resilience building; and
- promote the idea of integrated action.

Dissemination information

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

The vulnerability/resilience (V&R) framework proposed by Briguglio et al. (2009) did generate considerable interest among small states and international organisations working in the interests of small states. This framework was used by

Table 2.2 Countries classified according to the vulnerability and resilience nexus

High vulnerability and low resilience		Borderline cases: high vulnerability and medium resilience		High vulnerability and high resilience	
Algeria	Haiti	Azerbaijan	Marshall Islands	Antigua/Barbuda	Korea
Angola	Iraq	Cape Verde	Montenegro	The Bahamas	Kuwait
Belarus	Libya	Grenada	Papua New Guinea	Barbados	Lithuania
Bhutan	Mauritania	Guyana	St Kitts & Nevis	Belgium	Luxembourg
Bolivia	Micronesia	Jamaica	St Vincent/Grenadines	Belize	Malaysia
Central African Rep.	Mongolia	Jordan	Seychelles	Botswana	Malta
Chad	Nicaragua	Kiribati	Swaziland	Brunei Darussalam	Mauritius
Comoros	Nigeria	Maldives		Chile	Netherlands
Congo, Dem. Rep.	São Tomé/Príncipe			Czech Republic	Oman
Congo, Republic	Sierra Leone			Dominica	St Lucia
Côte d'Ivoire	Solomon Islands			Estonia	Samoa
Djibouti	Tajikistan			Fiji	Saudi Arabia
Ecuador	Turkmenistan			Gabon	Singapore
Equatorial Guinea	Ukraine			Hong Kong	Slovak Republic
Guinea	Yemen			Hungary	Taiwan
Guinea-Bissau	Zimbabwe			Iceland	Tonga
				Ireland	Trinidad/Tobago
					UAR
					Vanuatu

(*continued*)

Table 2.2 Countries classified according to the vulnerability and resilience nexus (continued)

Low vulnerability and low resilience		Borderline cases: low vulnerability and medium resilience		Low vulnerability and high resilience	
Afghanistan	Liberia	Albania	Kenya	Australia	New Zealand
Argentina	Moldova	Armenia	Latvia	Austria	Norway
Brazil	Mozambique	Bangladesh	Lesotho	Bahrain	Poland
Burundi	Myanmar	Benin	Macedonia, FYR	Canada	Qatar
Egypt	Nepal	Bosnia & Herz.	Mexico	Denmark	Slovenia
Eritrea	Niger	Bulgaria	Morocco	Finland	Sweden
Ethiopia	Pakistan	Burkina Faso	Namibia	France	Switzerland
Gambia	Russia	Cambodia	Panama	Germany	United Kingdom
Iran	Senegal	Cameroon	Paraguay	Japan	United States
Kyrgyz Republic	Sudan	China	Peru		
Lao, PDR	Syria	Colombia	Philippines		
Lebanon	Tanzania	Costa Rica	Portugal		
Liberia	Togo	Croatia	Romania		
Madagascar	Uzbekistan	Cyprus	Rwanda		
Malawi	Venezuela	Dominican Rep.	Serbia		
Mali	Vietnam	El Salvador	South Africa		
		Georgia	Spain		
		Ghana	Sri Lanka		
		Greece	Suriname		
		Guatemala	Thailand		
		Honduras	Tunisia		
		India	Turkey		
		Indonesia	Uganda		
		Israel	Uruguay		
		Italy	Zambia		
		Kazakhstan			

the Commonwealth Secretariat to conduct V&R profiling on the ground in three small island states, namely Seychelles, St Lucia and Vanuatu, as explained in the book by Briguglio et al. (2010). These assessments were conducted so the small states involved could understand the factors that lead to their economic vulnerability and to identify priority areas for economic policy-making, to cope better with vulnerability and boost resilience.[69]

The V&R framework was also referred to in the report of the UN Secretary-General,[70] on the occasion of the five-year review of the Mauritius Strategy for the Further Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States.

The UN Economic and Social Commission for Asia and the Pacific (ESCAP) et al. (2010) sought to assess the impact of the global financial crisis by developing a vulnerability index, which is a composite indicator that measures a country's exposure to the global economic crisis and the country's coping capacity to mitigate the crisis. In Appendix 3 of their report, ESCAP et al. acknowledge that their approach was inspired by the work of Briguglio et al. (2009).

UNDESA, in preparation for the Third International Conference on SIDS in Samoa in 2014, has also embarked on developing a vulnerability and resilience framework, similar to the approach pioneered by Briguglio et al. (2009). According to the UNDESA website, this exercise was piloted in seven SIDS: two in the Caribbean (Jamaica, Barbados), three in the Indian Ocean (Comoros, Mauritius, Seychelles) and two (Tonga, Vanuatu) in the Pacific from September 2013 to April 2014.[71] The objective of this exercise was to test the framework methodology in practice and to incorporate the lessons and best practices from the pilot projects into further refinement and development of the framework.

Encouraging quantitative estimation of resilience building

The quantitative estimation of the indices developed in this study can help small states to develop a common language for discussion on vulnerability and resilience. One often finds that parties engaged in debate disagree because of a lack of common definitions.

In the case of the vulnerability and resilience indices, the quantification of the components required careful definitions, and this could help focus the discussion on matters directly relevant to the issues under consideration. This is because quantifying variables, though taxing and not always possible, compels the researcher to concentrate on relevant, well-defined indicators. As is evident in the above discussion, the present author has been at pains to assign a precise definition to the variables and to choose an appropriate index that matches the definitions.

Promoting the idea of integrated action

Although a composite index yields a single-value measure of the phenomena under consideration, it summarises 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 integrated action and give a high profile to certain policies that can strengthen resilience. In this regard, the index can be useful for communication and to alert stakeholders about failures and success stories relating to the components of the resilience index.

2.7.2 Policy implications at the national level

Embedding the resilience framework into national strategies

As explained above, small states have specific characteristics that render them particularly exposed to external economic shocks. This means that economic changes in these states depend to a large extent on factors outside their control. In a globalised world, all countries are to an extent influenced by external forces, but small states are especially vulnerable in this regard. Resilience building is therefore of particular relevance and of major importance for such states.

The outcome of the V&R framework, discussed above, produced interesting tendencies, namely that many small states can succeed economically in spite of their economic vulnerability if they adopt good economic, social, political and environmental governance, which could enable them to reduce and even withstand the negative effects of external shocks. It therefore follows that it benefits small states to embed resilience-building measures into their plans and strategies, to promote macroeconomic stability and market flexibility without taking excessive risks. As has been argued above, good political, social and environmental management are also conduce to resilience building.

Profiling to identify resilience strengths and weaknesses

The methodological framework proposed in this chapter can be used to assess resilience gaps in particular countries. Profiling for resilience strengths and weaknesses first requires the identification of economic vulnerabilities and the resilience gaps in a country. This exercise could be carried out in consultation with stakeholders on the ground, including the government, politicians representing different ideologies, experts in the various aspects of political, economic, social and environmental governance, and representatives of different civil society groups. A method for conducting such a profiling exercise in practice has been described by Briguglio et al. (2010).

Once the resilience strengths and weakness have been identified, measures to maximise the strengths and address the weakness can be drawn up and mainstreamed into national strategic directions. For example, if it is found that macroeconomic stability is endangered by lack of fiscal discipline leading to the accumulation of public debt, or that there is too much market rigidity leading to lack of response in the face of shortages or surpluses, measures could be introduced to address these weaknesses. This argument also applies to gaps in the other resilience-building policies identified in this study, including political, social and environmental governance.

Implications for domestic and foreign direct investment (FDI)

Investment, whether originating domestically or from foreign sources, is an important contributor to growth and development. One expects that, everything else remaining equal, domestic and foreign investments are more likely to be attracted to a country that is well-governed economically and that enjoys political and social stability, than to a badly governed and socially unstable country. Other factors that serve to attract investment are good-quality infrastructure, including telecommunications, and a favourable business culture; these are also factors associated with good economic governance.[72] Small states tend to be disadvantaged with regard to investment attraction by their small domestic markets and poor natural resource endowments; however, good economic governance can to some extent make up for these inherent deficiencies.

The study presented in this chapter has obvious implications for investment attraction because of the connection between economic resilience building and factors that are conducive to investment attraction, including good economic, social and environmental governance. Small countries such as Singapore, Malta and Mauritius manage to attract substantial FDI, even though they lack natural resources and have a relatively small domestic market.

2.7.3 Policy implication at the international level

Vulnerability and international community support for small states

Although, as shown in this chapter, small states tend to be highly economically vulnerable, this condition is generally not considered to be an entitlement for aid and/or for exceptions from certain obligations, which are usually granted to countries with low per capita income.

An important implication of the present study, with regard to conditionalities relating to aid and other forms of support, is that resilience building should feature as a major objective of such support for small states. Briguglio (2010) argues that aid aimed at promoting and supporting economic stability, market efficiency, social development and environmental management is likely to have a lasting effect on recipient countries. This is not only because such aid helps build economic resilience, but also because it is likely to foster the belief in the recipient country itself that it can climb the development ladder through improved economic governance.

A vulnerability criterion in schemes with small states as beneficiaries

The V&R framework proposed in this chapter has important implications for donor countries and international organisations, principally because, when donor schemes are based mainly on the income per capita criterion, many small states are disqualified from benefitting from certain schemes because they are middle-income countries.

Briguglio (2013) argues that, while international organisations generally acknowledge that small economies tend to be highly economically vulnerable, the interventions offered by them do not always adequately address the special concerns of small, vulnerable economies (SVEs). Generally speaking, those small states that benefit from

special entitlements and exceptions do so as a result of being low-income countries, such as least developed countries (LDCs) that benefit from special treatment by the World Trade Organization (WTO) and the World Bank.[73]

For this reason, this chapter proposes that a vulnerability criterion should effectively be factored in when devising schemes to support small states and that, when such schemes are mainly triggered by the vulnerability criterion, the support to such states should be directed mostly at enabling them to improve their economic, social, political and environmental governance, to enhance their economic resilience.

The World Bank and small states

The portfolio of development-facilitating instruments available to all World Bank members is also available to small states, but the World Bank offers the 'small island exception' within its International Development Association (IDA) schemes. The small island exception[74] does offer the possibility of concessional support to middle-income SVEs but, generally speaking, the World Bank is not one of the most attractive sources of financial support for small states. This is mostly because of the burdensome conditionalities attached to such support, sometimes based on a 'one-size-fits-all' approach.[75] If a vulnerability criterion is effectively factored into the World Bank's support schemes, many middle-income small states will be able to benefit better from World Bank funds. When such support is triggered on the basis of a vulnerability criterion, it should mainly be directed at building the economic resilience of the beneficiary small state.

The IMF and support eligibility

The IMF has only recently given specific attention to small states as a category of countries,[76] and the voice of such states is generally considered not to be strong enough within this organisation. Broome (2011) contends that small states have a weak voice in their negotiations with the IMF, in spite of the fact that small states face higher stakes than larger economies and have a narrower range of policy choices at their disposal.

While there is no special programme designed for small states, the IMF contends that country-specific mechanisms offered by the fund cater well for these countries' needs. According to the IMF (2013), recent reforms in certain mechanisms of special interest for small states, such as introduction of the new emergency assistance initiatives, brought an increase in the usage of the fund's tools by both low-income and market-access small states, although these changes may also be attributed to the global financial crisis. The recent reform in the IMF brought two flexible, short-term lending mechanisms of specific interest for small states, namely (a) the Standby Credit Facility and (b) the Rapid Credit Facility.

Griffith-Jones and Tyson (2010), however, argue that the focus of the IMF's compensatory financing, including the automatic provision of rapid and significant liquidity for countries facing purely external shocks, has been aimed at low-income countries and therefore generally excludes middle-income small states.

Again, if a vulnerability criterion were effectively factored into the IMF's support schemes, the IMF would better serve many middle-income small states. As was argued with regard to World Bank schemes, when such support is triggered on the basis of a vulnerability criterion, it should be directed mainly at economic resilience building of the beneficiary small state.

International trade and the WTO

Within the World Trade Organization, a work programme on SVEs[77] was put in place in 2001 within the overall framework of the Doha Development Agenda, in order 'to frame responses to the trade-related issues, identified for the fuller integration of small, vulnerable economies into the multilateral trading system, and not to create a sub-category of WTO members' (Ministerial Declaration 2001, para. 35). A list of proposals put forward by SVEs addressing trade-related issues that affect them is presented in the WTO document *An Approach to Framing Responses to the Trade-Related Problems of Small Economies*.[78] These proposals are based on the special characteristics of SVEs, including a high degree of economic vulnerability.

One criticism of the SVEs work programme is that it encompasses among its membership not only small states[79] but larger states as well, as membership is based on the share of a country's trade in international trade, not smallness per se.[80]

Another factor relates to the weak negotiating power of small states within the WTO. Such weakness may emanate from capacity constraints, such as a small pool of negotiators and limited budget allocations (Jones et al. 2010). According to Panke (2012), this leads to difficulties in preparing positions for all items on the negotiation agenda and in developing negotiation strategies in great detail, which might inhibit small states from successfully influencing negotiation outcomes. Horscroft (2006) contends that the outcomes of WTO negotiations require consensus, starting with the most powerful countries and progressively incorporating other major players until it reaches the periphery, namely the small states, by which time consensus is a foregone conclusion.

The small states within the WTO argue that they should be considered for special treatment on the basis of their special characteristics, notably proneness to external shocks (Palayathan 2004). Palayathan further contends that the pressures arising from dismantling the preferential trade arrangements of a number of small states have eroded a safety valve, which used to somewhat compensate for their inherent disadvantages.

In this regard, the effective use of a vulnerability criterion, discussed above, may be useful to better identify small vulnerable economies and to address their special circumstances.

Implications regarding international and bilateral donors

Bilateral donors are mostly Organisation for Economic Co-operation and Development (OECD) countries, with the European Union (EU) being at the

forefront of supporting small island developing states, many of which are former colonies of EU member countries. Again an implication of this chapter with regard to development support by bilateral donors is that aid for improving economic governance would strengthen the ability of small states to minimise the negative effects of external shocks, taking into consideration the special circumstances of each recipient country.

Regional co-operation

Owing mostly to the problem of indivisibility of certain overhead costs, regulatory frameworks, particularly those required for good economic and environmental governance, may be prohibitively expensive for a single small state on its own, but affordable regionally.[81] For this reason small states could benefit from regional co-operation by jointly undertaking policy measures conducive to resilience building.

Such co-operation could, for example, be successfully undertaken in strengthening cross-border environmental governance in the region, by putting in place region-wide competition law and policy, and by developing regional regulatory frameworks for telecommunications and environmental management.

Environmental governance and sustainable development

An implication of the study presented in this chapter is that environmental management is a pillar of economic resilience building. In the international arena, small states made their voice heard on environmental management in the context of sustainable development. This was to a large extent a consequence of the lobbying role of the Alliance of Small Island States (AOSIS) within the UN, which resulted in the global conference on the sustainable development of SIDS held in Barbados in 1994. A sequel conference was held in Mauritius in 2005 and a third one is due to be held in Samoa in 2014. The two outcome documents of the Barbados Global Conference[82] and the Mauritius International Meeting[83] identified a number of major environmental concerns for small states, with climate change placed on top of the list.[84] AOSIS also has a relatively strong voice in climate change negotiations,[85] as evidenced during the various Conferences of the Parties (COP).[86]

Therefore, as a strategic direction at the upcoming Third SIDS Global Conference to be held in Samoa in September 2014, the governments of SIDS should link the need to improve their environmental governance with economic resilience building, in view of their high degree of vulnerability. In this regard, the international community should supplement the efforts by SIDS governments themselves.

It should be noted that some analysts argue that the international community has not been sufficiently supportive in the implementation of the Barbados Programme of Action (United Nations 1994) and the Mauritius Strategy (United Nations 2005). As the UN Secretary General remarked during the ten-year review on the Mauritius Strategy, 'there is evidence that existing support has increasingly fallen short of the mounting challenges faced by these States, including those brought about by climate change'.[87]

2.8 Conclusion

The overall conclusion of this chapter is that small states tend to be highly exposed to external economic shocks because of their inherent characteristics, including a high degree of economic openness, exacerbated by a high degree of dependence on a narrow range of exports and on strategic imports. However, this should not be construed as an argument for complacency on the part of small states, because a number of policy options are open to them which could enable these states to minimise the negative effects of external economic shocks.

Policies that are conducive to economic resilience building include the promotion of macroeconomic stability and market flexibility, while at the same time taking care not to take excessive risk, particularly on the financial markets. Other resilience-building policies discussed in this chapter are good political governance, social development and environmental management.

The major messages implied in this analysis are:

(a) economic resilience building is multifaceted and this calls for a holistic approach where social, political and environmental governance policies accompany and support economic policies;

(b) given that small states tend to be highly exposed to external shocks, they should assign major importance to resilience-building policies and should embed such policies into their national plans and strategies; and

(c) multilateral and bilateral donors should effectively factor vulnerability criteria into their schemes to support small states.

Notes

1 Briguglio et al. (2009) published a similar study with the same data and same results as Briguglio et al. 2006, but the 2009 paper included revised text, following comments by the reviewers.

2 These indices can be grouped into three broad categories, namely (a) the Briguglio-type indices (e.g. Briguglio and Galea 2003), which utilise a limited number of variables, including trade openness, rescaled using the max–min formula, often summed on the basis of equal weights; (b) the Commonwealth-type indices (e.g. Atkins et al. 2000), which are similar to the Briguglio-type indices, but the variables are not rescaled, with the weights of the components being derived through a regression method; and (c) the Committee for Development Policy of the United Nations (CDP)-type of indices (e.g. Guillaument 2009), also utilising the max-min formula to rescale a large number of variables as components, which exclude trade openness. The max-min formula utilised by the Briguglio-type and the CDP-type indices can be expressed as follows:

$$XRi = (Xi - X_{min}) / (X_{max} - X_{min}); i = 1,2,3,\ldots,n$$

where:

- XRi is the rescaled (or normalised) observation i in an array of n observations;
- Xi is an actual observation i in the same array of observations;
- Xmin is the minimum value the same array of observations; and
- Xmax is the maximum value in the same array of observations.

A major problem with the use of this formula relates to extreme outliers. Such outliers may distort the results of the spread of rescaled values. Leaving out extreme outliers is a procedure commonly used in vulnerability indices, e.g. Crowards (2000) and UN Department of Economic and Social Affairs (UNDESA) (2011).

3 Thus self-inflicted exposure to shocks would, in line with this framework, be included under the heading of resilience building, as a negative factor. In this sense, resilience building can be considered as a continuum, ranging from policies that highly exacerbate vulnerability to external shocks to policies that highly enable a country to withstand external shocks.

4 Some authors do not distinguish between the causes and the manifestation of vulnerability. For example, the CDP economic vulnerability index (CDP-EVI) (Guillaumont 2009) includes both, namely a component relating to the structure of the economy (cause of vulnerability) and a component relating to the manifestation of vulnerability (export instability).

5 Measured as exports and imports of goods and services as a ratio of GDP.

6 It was pointed out by Briguglio (1997), with regard to export concentration, that such concentration can be observed in both trade in goods as well as trade in services. Up to then, vulnerability indices utilised the concentration index devised by the UN Conference on Trade and Development (UNCTAD), which covers merchandise only. Briguglio devised a concentration index of exports of goods and services by also considering tourism and financial services in addition to merchandise exports. Export concentration was taken to be the percentage of the three highest export categories in total exports of goods and services.

7 Dependence on strategic imports was measured in terms of imports of commercial energy as a percentage of imports plus the production of commercial energy, while dependence on foreign sources of finance was taken to be remittances, capital and financial inflows as a percentage of GDP.

8 The indicators used to measure disaster proneness are various and include economic damage in relation to GDP (Briguglio 1995), the percentage of the population affected by natural disasters (Wells 1997; Atkins et al. 1998, 2000; Crowards 2000) and the number of deaths caused by natural disasters as a proportion of total population. Disaster proneness is included in economic vulnerability indices because disasters cause economic shocks over which a country has little control. Thus, this variable has been included in vulnerability indices because of the economic destabilising effects of disasters. This variable has been included in the vulnerability index constructed in the study presented in this chapter for the same reason. Cordina and Farrugia (2005) argued that the inclusion of disaster proneness in a vulnerability index might bias results because disaster variables are based on past events that need not be repeated in the near future.

9 Other studies on the economic vulnerability index include Chander (1996); Wells (1996, 1997); Crowards (1999, 2000a); Atkins et al. (1998, 2000); UNDESA (2011); Baritto (2008); and Turvey (2007).

10 Cordina (2008) – reacting to the argument that openness to international trade, often included in vulnerability indices, constitutes a source of livelihood for most small economies – argues that, while this is true, openness also renders small states susceptible to shocks in demand and terms of trade over which they can exercise very little control. The latter consideration justifies the inclusion of openness to international trade as a component of vulnerability.

11 Gonzales (2000) points out, with regard to the various vulnerability classifications, that 'While small developing states on average emerge as being comparatively vulnerable, rankings of individual countries can differ substantially between alternative indices'.

12 It can be argued that small economies are price-takers and therefore if inflation were measured by the retail price index, which covers imported goods and services as well as locally produced goods and services, a significant proportion of inflation would be externally determined. In the revised version of the resilience index, proposed in the present study, the price index utilised is the GDP deflator, which relates to domestically produced goods and services.

13 On this issue see also Group of 30 (2010) and Cecchetti (2009).

14 A discussion on the meaning of governance is available at: web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/MENAEXT/EXTMNAREGTOPGOVERNANCE/0,,contentMDK:20513159~pagePK:34004173~piPK:34003707~theSitePK:497024,00.html (accessed 23 May 2014).

15 A correlation analysis between the non-income components of the HDI and a cohesion index proposed by Foa (2011), carried out by the present author for the countries covered by the cohesion index, indicated that these two variables are highly correlated.

16 Environmental management is particularly important in small islands for adaptation to climate change, as climate change could potentially usher in catastrophic impacts associated with, among other things, sea-level rise, health hazards and increased frequency of extreme events (see Intergovernmental Panel on Climate Change (IPCC) 2007, chapter 16).

17 The relationship between economic development and environmental quality is often discussed in terms of what is known as the Environmental Kuznets Curve (EKC), which is based on the hypothesis that, as a country develops, environmental degradation increases at first until some level of development is attained, after which environmental degradation would tend to decrease. Roberts (2006) argues that the small island states located in the Atlantic Ocean, Indian Ocean, Mediterranean Sea and South China Sea (known collectively as AIMS) that have succeeded economically have done so at great environmental cost, an argument that would seem to suggest that these small states are still on the upward sloping segment of the EKC.

18 The 'Mauritius Strategy' (United Nations 2005), paragraph 81, calls for the establishment of a task force to elaborate a resilience index, supported by the international community. Such an exercise was carried out by the Commonwealth Secretariat in collaboration with the Islands and Small States Institute of the University of Malta, culminating with the publication of Briguglio et al. (2006).

19 As noted elsewhere in this study, the environment management component was absent from the earlier study.

20 The choice of variables used for the construction of the vulnerability index and the resilience index constructed in this study was based on a number of desirable criteria including relevance, simplicity, transparency, reproducibility and affordability. Care was also taken to use indicators with as wide a coverage of small states as possible, given that the focus of the study is on small states. For further information on the desirable criteria, see Briguglio (2003).

21 As indicated above, there is some debate about whether the disaster proneness index should be included in the vulnerability index. The index was therefore recomputed without this component, as shown in Appendix 2.1b(v), and the results did not change drastically, with the main difference being that countries with high disaster proneness, including Samoa, St Lucia, St Kitts and Nevis, Haiti, Grenada, Vanuatu, Dominica, and Antigua and Barbuda, received slightly lower scores.

22 The population size is measured in logs in order to reduce the spread on the vertical axis from a few thousands in some Pacific island states to more than a billion in China and India. This implies that the relationship between a given variable and the actual population is a power function of the type $Y = AX^b$.

23 The fitted equation is OPN = 94.284 – 11.674 *P*, where OPN is trade openness and *P* is the log of population size. The correlation coefficient (R^2) = 0.130; *t*-statistic = –4.82; *N* = 183 countries. It can be seen from the scatter diagram that there is considerable variation around the fitted line.

24 Information about UNCTAD's concentration index is available at: unctadstat.unctad.org/TableViewer/summary.aspx (accessed 23 May 2014). It should also be noted that UNCTAD utilises the Herfindahl–Hirschmann formula to construct its concentration index, and includes only exports greater than $100,000 or 0.3 per cent of total exports.

25 The fitted equation is EXC = 79.23 – 4.376 *P*, where EXC is export concentration and *P* is log of population size. The correlation coefficient (R^2) = 0.045; *t*-statistic = –2.5; *N* = 183 countries.

26 The fitted line is DSI = 40.624 - -3.228 *P*, where DSI is dependence on strategic imports and *P* is log of population size. The correlation coefficient (R^2) = 0.062; *t*-statistic = –3.5; *N* = 183 countries.

27 Available at: www.emdat.be/database (accessed 23 May 2014). This database is maintained by the Centre for Research on the Epidemiology of Disasters (CRED), Université catholique de Louvain, Brussels. EM-DAT distinguishes two generic categories for disasters (natural and technological), the natural disaster category being divided into five subgroups, which in turn cover 12 disaster types and more than 30 subtypes. This index uses the data for natural disasters, adjusted as explained in the text. An event is included on the database if at least one of the following criteria is fulfilled: (i) ten or more people reported killed; (ii) 100 or more people reported affected; (iii) declaration of a state of emergency; (iv) call for international assistance. Natural disasters

are categorised as geophysical (e.g. an earthquake or volcano); hydrological (e.g. a flood); meteorological (e.g. a storm); climatological (e.g. extreme temperature); and biological (e.g. an epidemic).

28 The equation for the fitted line is DST = 91.257 − 18.712 *P*, where DST is disaster damage as a percentage of GDP and *P* is the log of the population. The correlation coefficient (R^2) = 0.100; *t*-statistic = –4.5; *N* = 183 countries.

29 Another indicator, which was used in Briguglio and Galea (2003) and Crowards (1999), is 'peripherality', associated with high transport costs and marginalisation from main commercial centres. Briguglio and Galea argued that peripherality adds to the problem of trade openness with regard to external shocks. One problem with this 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. This is mainly because there is the problem of establishing where the relevant commercial centre is located. In addition, in the case of certain island states, a relatively large proportion of international trade is directed to their former colonising masters, even though other centres of commercial activity could be more proximate. Two variables that may reflect the effects of remoteness are (a) the ratio of FOB/CIF factors and (b) the ratio of transport and freight costs to imports, both of which have been used in vulnerability indices to capture peripherality. However, these two indices may both be influenced to a large extent by factors other than remoteness, including landlockedness, trade relations with former colonising powers, national ownership of means of sea and air transport and others. For these reasons, the peripherality index was not used in the study presented in this chapter.

30 It should be stated, with regard to Figure 2.7, that, when constructing composite indices, the weighting scheme applied to the components is essentially subjective. Alternative weighting schemes for the four components were utilised as shown in Appendix 1b(v). See Briguglio (2003) and Farrugia (2007) for a discussion on the subjectivity of weighting schemes in composite indices.

31 The equation for the fitted line is EVI = 0.676 – 0.091 *P*, where EVI is economic vulnerability and *P* is the log of the population size. The correlation coefficient (R^2) = 0.350; *t*-statistic = –9.80; *N* = 183 countries. The average of the four components was rescaled using the min–max formula.

32 The alternative weighting schemes shown in Appendix 1b(v) confirm the general tendency that small states as a group tend to be more economically vulnerable than larger countries.

33 It should be noted here that the EVI and GDP per capita are not correlated, indicating that rich as well as poor countries may be inherently highly economically vulnerable. The equation of the fitted line between the EVI and the log of GDP per capita was EVI = 0.321 − 0.0009 log (GDPPC); R^2 = 0.00012; *t*-statistic = –0.15; *N* = 183 countries.

34 Briguglio et al. (2009) also used the annual government fiscal deficit as an indicator of the adequacy of government finances. However, this variable suffers from limited 'small state' coverage and it was therefore not used for the purpose of the study presented in this chapter.

35 Apart from its relevance to trade imbalances, the current account reflects the difference between national savings and investment. National savings are associated with resilience because, if an economy suffers from chronic savings shortages, it will not have room for manoeuvre in the face of adverse shocks.

36 For a discussion of external reserves in terms of coverage of monthly imports and resilience, see Crispolti and Tsibouris (2011).

37 For a discussion on the economic effects of the current account balance, see Ghosh and Ramakrishnan (2006).

38 Available at: www.imf.org/external/pubs/ft/weo/2013/01/weodata/index.aspx (accessed 23 May 2014).

39 The equation for the fitted STB = 0.495 + 0.0118 *P*, where STB is the stability index and *P* is the log of the population size. The correlation coefficient (R^2) = 0.005; *N* = 183 countries.

40 Information about the EFW Regulation Index is available at: www.freetheworld.com/2013/EFW2013-appendix-notes-sources.pdf. The most recent index pertains to the year 2013, and is available at: www.freetheworld.com/2013/EFW2013-complete.pdf (accessed 23 May 2014).

41 The EFW Index has 42 variables, organised into 23 components and five major areas, namely (i) size of government; (ii) legal system and security of property rights; (iii) sound money; (iv) freedom to trade internationally; and (v) regulation. The index is based on data sourced from

surveys, expert panels and generic case studies, including sources such as the International Monetary Fund, World Bank and World Economic Forum that provide data for a large number of countries. Most of the scores utilise the min–max formula to rescale the data (1 to 10). The methodology is further explained in the Explanatory Notes and Data Sources Appendix of Gwartney et al. (2013).

42 The 'labour market regulations' component consists of six subcomponents, namely (i) hiring regulations and minimum wage; (ii) hiring and firing regulations; (iii) centralised collective bargaining; (iv) hours regulations; (v) mandated cost of worker dismissal; and (vi) conscription. The sources of the data are the World Economic Forum's *Global Competitiveness Report* (2013), the World Bank Doing Business Index and data compiled by the International Institute for Strategic Studies.

43 The 'business regulations' component consists of six subcomponents, namely (i) administrative requirements; (ii) bureaucracy costs; (iii) starting a business; (iv) extra payments/bribes/favouritism; (v) licensing restrictions; and (vi) cost of tax compliance. The sources of the data are the World Economic Forum's Global Competitiveness Report and the World Bank Doing Business Index.

44 The EFW Index excludes 32 countries, as listed in Appendix 2.2b of the current study, many of which are small states.

45 The equation for the fitted line is MFX = 7.388 – 0.3086 *P*, where MFX is market flexibility and *P* is the log of population size. The correlation coefficient (R^2) = 0.0545; $N = 183$. When the actual data (that is the data available on the EFW Index, without the estimated values) were plotted against country size, a similar pattern emerged.

46 See Appendix 2.2b(iii) for an explanation of how the 'financial prudence' index was constructed.

47 The fitted line of this equation is LFP = 2.627 + 0.0214 *P*; $R^2 = 0.0087$, where LFP is lack of financial prudence and *P* is the log of the population size; $N = 183$ countries.

48 The fitted line of this equation is FDT = 1.705 + 0.419 *P*; $R^2 = 0.077$, where FDT is financial depth and *P* is the log of the population size; $N = 183$ countries.

49 The equation for the fitted line is FNR = 0.308 + 0.0102 *P*; $R^2 = 0.0027$, where FNR is financial riskiness and *P* is the log of population size.

50 It should be recalled that the 'financial riskiness' index was rescaled to take a value of between 0 and 1.

51 Alternative weighting schemes are presented in Appendix 2.2b(viii).

52 The fitted line is AMFX = 0.6879 – 0.0466 *P*, where AMFX is the adjusted market flexibility index and *P* is the log of the population size. The correlation coefficient (R^2) = 0.0446; $N = 183$ countries.

53 The indicators' website is available at: info.worldbank.org/governance/wgi/index.asp. Other possible governance indicators were considered, including the second component of the Economic Freedom of the World Indicators, entitled 'Legal Structure and Property Rights' (available at: www.freetheworld.com/2013/EFW2013-complete.pdf), the Rule of Law Index (available at: dx.doi.org/10.2139/ssrn.1966257), the Corruption Perception Index (available at: www.transparency.org/files/content/pressrelease/2012_CPITechnicalMethodologyNote_EMBARGO_EN.pdf), the World Bank's Country Policy and Institutional Assessment (available at: data.worldbank.org/indicator/IQ.CPA.PUBS.XQ), the Global Competitiveness Indictors component entitled 'public institutions', composed of legal and administrative frameworks (available at: www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2013-14.pdf), and the Institutions Climate Index (available at: www.ifw-kiel.de/ausbildung/asp/asp-wp/2012/aspwp457.pdf). It was decided to utilise the WGI in the resilience index, mostly because of the criteria of 'small state' coverage and relevance to the issue being explored.

54 The equation for the fitted line is GVN = 0.854 – 0.293 *P*, where GVN is the governance score (ranging from −2.5 to +2.5) and *P* is the log of the population size. The correlation coefficient (R^2) = 0.055; $N = 183$ countries.

55 Other social indicators considered were the United Nations social indicators (available at: unstats.un.org/unsd/demographic/products/socind/), the World Bank social indicators (available at: data.worldbank.org/topic/social-development) and the 'social inclusion and equity' cluster of CPIA (available at: http://data.worldbank.org/indicator/IQ.CPA.SOCI.XQ/countries). It was decided to utilise the non-income components of the HDI in the resilience index, a decision based mostly on the criteria of 'small state' coverage and relevance to the issue being explored.

56 Average number of years of education received by people aged 25 and older, converted from educational attainment levels using official durations of each level.

57 Number of years of schooling that a child of school entrance age can expect to receive if prevailing patterns of age-specific enrolment rates persist throughout the child's life.

58 Number of years a newborn infant could expect to live if prevailing patterns of age-specific mortality rates at the time of birth stay the same throughout the infant's life.

59 The equation for the fitted line is SOC = 0.694 – 0.027 *P*, where SOC is non-income HDI and *P* is the log of the population size. The correlation coefficient (R^2) = 0.008; N = 183 countries.

60 Other indicators considered were the United Nations indicators (available at: unstats.un.org/unsd/environment/qindicators.htm), the European Environment Agency (2012) *Environmental Indicator Report* (available at: www.eea.europa.eu/publications/environmental-indicator-report-2012), the environmental vulnerability index (EnVI) developed by SOPAC (available at: www.sopac.org/index.php/environmental-vulnerability-index) and the 'ecological footprint' (available at: www.footprintnetwork.org/). It was concluded that the indicator sets, with the exception of the EnVI, suffered from the weakness of limited small country coverage. The EnVI, however, had two major drawbacks, namely that it is not focused on environmental governance and it has not been updated since 2005.

61 Available at: epi.yale.edu (accessed 23 May 2014). This index builds on the Environmental Sustainability Index proposed in Esty et al . (2005).

62 A detailed description of how the indicator weights were established is available at: epi.yale.edu/sites/default/files/downloads/reepidataspreadsheets.zip (accessed 23 May 2014).

63 Available at: www.epi.yale.edu/sites/default/files/downloads/Appendix1%2012.20.12.pdf (accessed 23 May 2014).

64 The equation for the fitted line is: EPI = 44.986 + 1.3044 *P*, where EPI is the environmental performance index and *P* is the log of population size. The correlation coefficient (R^2) = 0.017; N = 183 countries.

65 Alternative weighting schemes for the index components are presented in Appendix 2.1b(v).

66 The equation for the fitted line between the ERI and the log GDP per capita (GDPPC), averaged over a ten-year period is: ERI = –0.1441 + 0.778 log GDPPC; R^2 = 0.634; N = 183 countries.

67 The threshold between high and low resilience scores was set at 0.513 and that between high and low vulnerability scores was set at 0.332.

68 It should be noted that the boundaries of each quadrant were the average scores of the two indices. Different thresholds would have produced different classifications, although the general tendencies shown in Table 2.1 will remain true if other thresholds are used.

69 UNCTAD (2013a) also used a form of the V&R framework in discussing ways in which external shocks can be mitigated to reduce the harm on trade.

70 Available at: www.un.org/ga/search/view_doc.asp?symbol=A/65/115 (accessed 23 May 2014), footnote 17.

71 Information available at: www.sids2014.org/content/documents/260attrdlu7.pdf (accessed 23 May 2014).

72 For a discussion on what attracts FDI, see Blomström (2001) and Dunning (1993). Read (2006) discusses the attraction of FDI in SIDS.

73 In the case of graduation from least developed country (LDC) status, where a vulnerability index is used as a criterion, its effect may be negligible because economic vulnerability is just one of three graduation criteria and graduation requires that a country fulfil at least two of the three criteria. In addition, if the per capita gross national income (GNI) of an LDC would have risen to a level at least double the graduation threshold, the country will be deemed eligible for graduation regardless of its performance under the other criteria. See UNCTAD (2013b). See also the statement by the Government of the Maldives (2009) on this issue, available at: www.maldivespartnershipforum.gov.mv/pdf/Impacts%20of%20LDC%20Graduation.pdf (accessed 23 May 2014).

74 IDA is an attractive tool for developing countries, as it offers loans with little or no interest that can be repaid over the period of 25–40 years with a grace period of 5–10 years. This mechanism was designed to assist the poorest countries with concessional funding. However, since 1985 small island states have been able to use this tool via the 'small island economy exception', even

if their per capita incomes exceed the cut-off income threshold but lack the International Bank of Reconstruction and Development (IBRD) creditworthiness requirement. The small island economy exception includes two important measures designed specifically for small states, namely (a) the elimination of the maximum per capita allocation ceiling and (b) doubling the base allocation. With these changes, the country allocation for low-income small island economies has been increased. Under the IDA scheme there are two exceptions of special interest to small states, namely (a) allocations related natural disasters and (b) provisions for regional initiatives (World Bank 2010). The first exception was used, for example, by Tonga and Samoa to receive additional funds after the 2009 tsunami (World Bank 2010). The publication Commonwealth Secretariat (2012) contends that the CRW – which admittedly is a welcome development – as a mechanism lacks the scale of funding needed to successfully combat exogenous shocks.

75 The World Bank tried to reduce these disadvantages, and one of the tools that can eventually assist in the process is the Programme for Result Financing (P4R).

76 IMF (2013) articulates its position with regard to small states.

77 The term 'small, vulnerable economies' as defined within the WTO applies to 'Members with economies that, in the period 1999 to 2004, had an average share of (a) world merchandise trade of no more than 0.16 per cent or less, and (b) world trade in non-agricultural products of no more than 0.1 per cent and (c) world trade in agricultural products of no more than 0.4 per cent'. See: TN/AG/W/4/Rev.4/, paragraph 157, available at: www.wto.org/english/tratop_e/dda_e/chair_texts11_e/agric_e.doc (accessed 23 May 2014).

78 See: WT/COMTD/SE/W/13/Rev.1, available at: ctrc.sice.oas.org/TRC/WTO/SmallEcon/SEW13R1_e.doc (accessed 23 May 2014).

79 See, for example, the list of SVEs in 'Groups in the WTO', available at: www.wto.org/english/tratop_e/dda_e/negotiating_groups_e.pdf (accessed 23 May 2014).

80 See: *Briefing Note: Small, Vulnerable Economies,* available at: www.wto.org/english/thewto_e/minist_e/min11_e/brief_svc_e.htm (accessed 23 May 2014).

81 On this issue see Schiff (2002).

82 The full title of the document was *Barbados Programme of Action for the Sustainable Development of Small Island Developing States*, available at: http://www.un.org/ga/search/view_doc.asp?symbol=A/CONF.167/9. The conference of which this document is the outcome was held in April/May 1994.

83 The full title of the document was *Mauritius Strategy for the further Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States*, available at: http://www.un.org/ga/search/view_doc.asp?symbol=A/CONF.207/11 (accessed 23 May 2014). The Mauritius International Meeting, of which this document is the outcome, was held in January 2005. Of interest with regard to the present study is that at the meeting it was agreed that some form of metric was needed to assess the extent to which countries were building their economic resilience. This was reflected in paragraph 81 of the Mauritius Strategy, which stated that 'Consideration should be given to the establishment of a task force to elaborate a resilience index, supported by the international community. This work would be significantly enhanced as a result of the successful implementation of the activities outlined above'.

84 Small island states, particularly low-lying islands, are likely to be harmed by climate change more than other groups of countries, as a result of sea-level rise. Yet their greenhouse gas emissions at the global level are negligible. This ethical issue is highlighted in the IPCC Fourth Assessment Reports, in the chapter on small islands (WGII). See IPCC (2007), chapter 16.

85 AOSIS is a coalition of some 43 low-lying and small island countries, many of which are highly vulnerable to sea-level rise.

86 The Conference of the Parties (COP) is the supreme decision-making body of the United Nations Framework Convention on Climate Change (UNFCCC).

87 Available at: www.un.org/ga/search/view_doc.asp?symbol=A/65/115 (accessed 23 May 2014), 38.

88 There were missing data for government debt to GDP ratio for Afghanistan, Bangladesh, Kiribati, Micronesia, Mongolia, Papua New Guinea, Samoa and Sri Lanka. As data for these countries were available for the other components of the resilience index, it was decided to retain these countries and search for alternative sources of debt data, mostly from IMF Article IV reports.

89 The countries with missing EFWI data were Afghanistan, Antigua and Barbuda, Belarus, Bhutan, Comoros, Djibouti, Dominica, Equatorial Guinea, Eritrea, Grenada, Guinea, Iraq, Kiribati, Lao

PDR, Liberia, Libya, Maldives, Marshall Islands, Micronesia FS, St Kitts and Nevis, St Lucia, St Vincent and the Grenadines, Samoa, São Tomé and Príncipe, Seychelles, Solomon Islands, Sudan, Tonga, Turkmenistan, Uzbekistan and Vanuatu.

90 The 36 countries with missing 'financial prudence' data were Afghanistan, Antigua and Barbuda, The Bahamas, Belarus, Belize, Central African Republic, Comoros, Democratic Republic of the Congo, Republic of the Congo, Djibouti, Dominica, Equatorial Guinea, Eritrea, Fiji Islands, Grenada, Guinea-Bissau, Iraq, Kiribati, Maldives, Marshall Islands, Micronesia FS, Niger, Papua New Guinea, St Kitts and Nevis, St Lucia, St Vincent and the Grenadines, Samoa, São Tomé and Principe, Solomon Islands, Sudan, Syrian Arab Republic, Tajikistan, Togo, Tonga, Turkmenistan, Uzbekistan and Vanuatu.

91 Available at: data.worldbank.org/indicator/IC.LGL.CRED.XQ/countries?display=default.

92 The WGI is available at: info.worldbank.org/governance/wgi/index.asp (accessed 23 May 2014).

93 The data were sourced from the HDI website, available at: https://data.undp.org/dataset/Non-income-HDI-value/2er3-92jj (accessed 23 May 2014).

94 These were Antigua and Barbuda, Bahrain, Dominica, Fiji Islands, Grenada, Hong Kong, Kiribati, Marshall Islands, St Kitts and Nevis, St Vincent and the Grenadines, São Tomé and Principe, and Seychelles. As can be seen, these are mostly small states.

95 This is sourced from the EPI database itself, available at: epi.yale.edu/sites/default/files/downloads/reepidataspreadsheets.zip (accessed 23 May 2014).

96 This is sourced from the UNCTAD statistical database, available at: unctadstat.unctad.org/TableViewer/tableView.aspx?ReportId=95 (accessed 23 May 2014).

97 This is measured by the government effectiveness component of the WGI indicators.

98 There were a few missing country observations relating to child mortality in the EPI, as follows: Antigua and Barbuda, Dominica, and St Kitts and Nevis (for which the child mortality rates were assumed to be similar to those of St Vincent/Grenadines and St Lucia, for which data were available); Kiribati and Marshall Islands (for which the child mortality rates were assumed to be similar to those of Samoa and Tonga, for which data were available); and Seychelles (for which the mortality rates were assumed to be similar to that of Mauritius, for which data were available).

99 These were Afghanistan, Antigua and Barbuda, The Bahamas, Barbados, Belize, Bhutan, Burkina Faso, Burundi, Cape Verde, Central African Republic, Chad, Comoros, Djibouti, Dominica, Equatorial Guinea, Fiji Islands, The Gambia, Grenada, Guinea, Guinea-Bissau, Guyana, Hong Kong, Kiribati, Laos, Lesotho, Liberia, Madagascar, Malawi, Maldives, Mali, Marshall Islands, Mauritania, Mauritius, Micronesia, Montenegro, Niger, Papua New Guinea, Rwanda, St Kitts and Nevis, St Lucia, St Vincent and the Grenadines, Samoa, São Tomé and Principe, Seychelles, Sierra Leone, Solomon Islands, Suriname, Swaziland, Tonga, Uganda and Vanuatu.

100 Data was sourced from the *CIA Factbook,* which is available at: www.cia.gov/library/publications/the-world-factbook/rankorder/2241rank.html.

101 Landlockedness was an additional dummy variable included as a component of the EV index, but this did not enter significantly into the equation and was dropped.

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Appendix 2.1 Data for the economic vulnerability index

2.1a The economic vulnerability index and its components

Table A2.1.1 Data pertaining to the EVI and its components (See legend for column headings at the end of the table)

Countries	OPN	DSI	EXC	DST	EVI	EVI RS
Afghanistan	0.230	0.438	0.191	0.015	0.219	0.126
Albania	0.397	0.313	0.544	0.003	0.314	0.279
Algeria	0.305	0.226	0.952	0.050	0.383	0.389
Angola	0.473	0.232	1.000	0.000	0.426	0.458
Antigua & Barbuda	0.493	0.299	0.830	0.217	0.460	0.512
Argentina	0.179	0.125	0.478	0.015	0.199	0.095
Armenia	0.298	0.338	0.565	0.018	0.305	0.264
Australia	0.184	0.216	0.588	0.021	0.252	0.179
Austria	0.477	0.200	0.498	0.005	0.295	0.248
Azerbaijan	0.344	0.148	0.922	0.010	0.356	0.346
Bahamas	0.389	0.514	0.822	0.098	0.456	0.505
Bahrain	0.528	0.161	0.631	0.000	0.330	0.304
Bangladesh	0.206	0.326	0.101	0.101	0.184	0.070
Barbados	0.470	0.667	0.579	0.015	0.432	0.468
Belarus	0.637	0.541	0.539	0.008	0.431	0.466
Belgium	0.727	0.253	0.533	0.002	0.379	0.382
Belize	0.537	0.522	0.716	0.155	0.483	0.548
Benin	0.179	0.439	0.571	0.002	0.298	0.252
Bhutan	0.442	0.278	0.707	0.002	0.357	0.347
Bolivia	0.379	0.191	0.740	0.141	0.363	0.356
Bosnia & Herzegovina	0.470	0.345	0.396	0.012	0.306	0.265
Botswana	0.338	0.289	0.823	0.000	0.363	0.356
Brazil	0.112	0.244	0.536	0.007	0.225	0.135
Brunei Darussalam	0.463	0.206	0.959	0.000	0.407	0.427
Bulgaria	0.569	0.356	0.402	0.004	0.333	0.308
Burkina Faso	0.201	0.351	0.445	0.004	0.250	0.176
Burundi	0.274	0.313	0.415	0.000	0.251	0.177
Cambodia	0.490	0.269	0.213	0.051	0.256	0.185
Cameroon	0.178	0.415	0.633	0.000	0.306	0.266
Canada	0.271	0.190	0.499	0.006	0.242	0.162
Cape Verde	0.354	0.471	0.873	0.005	0.426	0.457
Central African Rep.	0.143	0.657	0.630	0.000	0.357	0.348
Chad	0.313	0.210	0.886	0.000	0.352	0.339
Chile	0.316	0.353	0.737	0.062	0.367	0.363
China	0.223	0.206	0.622	0.067	0.279	0.222
Colombia	0.162	0.164	0.680	0.014	0.255	0.184
Comoros	0.257	0.454	0.582	0.079	0.343	0.325
Congo, Democratic Rep.	0.569	0.362	0.843	0.001	0.443	0.485
Congo, Republic	0.606	0.179	0.911	0.000	0.424	0.454

(continued)

Countries	OPN	DSI	EXC	DST	EVI	EVI RS
Costa Rica	0.351	0.222	0.644	0.022	0.310	0.271
Côte d'Ivoire	0.399	0.556	0.668	0.000	0.406	0.425
Croatia	0.388	0.340	0.569	0.006	0.325	0.296
Cyprus	0.409	0.390	0.528	0.000	0.332	0.306
Czech Republic	0.592	0.152	0.641	0.016	0.350	0.336
Denmark	0.466	0.229	0.456	0.007	0.290	0.239
Djibouti	0.446	0.363	0.370	0.002	0.295	0.248
Dominica	0.450	0.431	0.727	0.218	0.457	0.507
Dominican Republic	0.245	0.422	0.502	0.030	0.300	0.256
Ecuador	0.298	0.341	0.820	0.053	0.378	0.381
Egypt	0.217	0.367	0.551	0.007	0.285	0.232
El Salvador	0.299	0.383	0.302	0.244	0.307	0.267
Equatorial Guinea	0.654	0.447	0.986	0.000	0.522	0.611
Eritrea	0.134	0.425	0.000	0.003	0.140	0.000
Estonia	0.727	0.310	0.403	0.002	0.361	0.353
Ethiopia	0.198	0.346	0.668	0.001	0.303	0.261
Fiji	0.549	0.583	0.617	0.077	0.456	0.506
Finland	0.375	0.285	0.500	0.000	0.290	0.240
France	0.244	0.258	0.459	0.006	0.242	0.163
Gabon	0.318	0.215	0.966	0.000	0.375	0.376
Gambia	0.166	0.498	0.699	0.000	0.341	0.321
Georgia	0.409	0.350	0.512	0.043	0.328	0.301
Germany	0.409	0.212	0.599	0.004	0.306	0.265
Ghana	0.330	0.301	0.653	0.001	0.321	0.290
Greece	0.246	0.401	0.588	0.025	0.315	0.280
Grenada	0.327	0.438	0.697	0.367	0.457	0.507
Guatemala	0.264	0.378	0.499	0.029	0.293	0.244
Guinea	0.271	0.422	0.867	0.000	0.390	0.400
Guinea-Bissau	0.208	0.560	0.875	0.000	0.411	0.433
Guyana	0.591	0.488	0.423	0.120	0.405	0.424
Haiti	0.292	0.603	0.299	0.403	0.399	0.415
Honduras	0.460	0.342	0.379	0.177	0.340	0.319
Hong Kong SAR	1.000	0.068	0.570	0.000	0.410	0.431
Hungary	0.810	0.164	0.604	0.010	0.397	0.411
Iceland	0.491	0.268	0.688	0.001	0.362	0.355
India	0.220	0.419	0.343	0.028	0.252	0.179
Indonesia	0.200	0.340	0.484	0.024	0.262	0.195
Iran, Islamic Republic	0.199	0.195	0.815	0.054	0.316	0.281
Iraq	0.321	0.318	0.981	0.000	0.405	0.424
Ireland	0.827	0.264	0.447	0.002	0.385	0.391
Israel	0.323	0.287	0.585	0.003	0.299	0.255
Italy	0.251	0.318	0.517	0.019	0.276	0.217
Jamaica	0.375	0.572	0.697	0.127	0.443	0.484
Japan	0.119	0.456	0.675	0.019	0.317	0.283
Jordan	0.516	0.460	0.508	0.018	0.375	0.377
Kazakhstan	0.325	0.158	0.850	0.002	0.334	0.310
Kenya	0.317	0.405	0.457	0.002	0.295	0.248
Kiribati	0.455	0.505	0.538	0.000	0.375	0.375
Korea	0.475	0.413	0.656	0.000	0.386	0.393
Kuwait	0.360	0.187	0.895	0.000	0.361	0.353

(continued)

Countries	OPN	DSI	EXC	DST	EVI	EVI RS
Kyrgyz Republic	0.616	0.378	0.333	0.050	0.344	0.327
Lao PDR	0.210	0.335	0.640	0.000	0.296	0.249
Latvia	0.495	0.339	0.401	0.005	0.310	0.272
Lebanon	0.302	0.373	0.383	0.007	0.266	0.202
Lesotho	0.719	0.355	0.300	0.000	0.343	0.325
Liberia	1.000	0.048	0.471	0.029	0.387	0.395
Libya	0.344	0.271	0.988	0.000	0.401	0.417
Lithuania	0.627	0.501	0.429	0.004	0.390	0.400
Luxembourg	1.000	0.221	0.624	0.007	0.463	0.517
Macedonia, FYR	0.551	0.304	0.321	0.014	0.298	0.252
Madagascar	0.313	0.331	0.449	0.101	0.298	0.253
Malawi	0.280	0.196	0.829	0.008	0.328	0.301
Malaysia	0.701	0.201	0.562	0.003	0.367	0.363
Maldives	0.697	0.505	0.958	0.141	0.575	0.696
Mali	0.223	0.361	0.296	0.000	0.220	0.128
Malta	0.864	0.407	0.432	0.000	0.426	0.457
Marshall Islands	0.549	0.000	0.989	0.000	0.385	0.391
Mauritania	0.618	0.492	0.827	0.000	0.484	0.551
Mauritius	0.536	0.458	0.441	0.027	0.366	0.361
Mexico	0.259	0.166	0.713	0.015	0.288	0.237
Micronesia	0.460	0.384	0.975	0.008	0.457	0.507
Moldova	0.584	0.335	0.321	0.097	0.334	0.311
Mongolia	0.580	0.391	0.752	0.336	0.515	0.600
Montenegro	0.501	0.411	0.722	0.000	0.409	0.429
Morocco	0.332	0.408	0.407	0.009	0.289	0.238
Mozambique	0.256	0.379	0.591	0.043	0.317	0.283
Myanmar	0.000	0.343	0.627	0.042	0.253	0.181
Namibia	0.453	0.212	0.555	0.005	0.306	0.265
Nepal	0.198	0.356	0.599	0.104	0.314	0.279
Netherlands	0.676	0.369	0.431	0.003	0.370	0.367
New Zealand	0.259	0.294	0.572	0.043	0.292	0.243
Nicaragua	0.502	0.446	0.521	0.204	0.418	0.445
Niger	0.288	0.330	0.699	0.001	0.330	0.303
Nigeria	0.305	0.337	0.949	0.002	0.398	0.413
Norway	0.324	0.144	0.651	0.001	0.280	0.224
Oman	0.360	0.198	0.809	0.027	0.348	0.333
Pakistan	0.145	0.516	0.505	0.037	0.300	0.257
Panama	0.687	0.157	0.485	0.004	0.333	0.309
Papua New Guinea	0.521	0.538	0.564	0.010	0.408	0.429
Paraguay	0.507	0.201	0.651	0.004	0.341	0.321
Peru	0.216	0.291	0.498	0.017	0.255	0.184
Philippines	0.283	0.336	0.457	0.028	0.276	0.217
Poland	0.403	0.208	0.563	0.000	0.293	0.245
Portugal	0.328	0.318	0.437	0.011	0.274	0.213
Qatar	0.336	0.076	0.895	0.000	0.327	0.298
Romania	0.350	0.200	0.518	0.000	0.267	0.203
Russia	0.247	0.174	0.709	0.003	0.284	0.229
Rwanda	0.186	0.253	0.684	0.000	0.281	0.225
St Kitts & Nevis	0.393	0.260	0.657	0.512	0.456	0.505
St Lucia	0.530	1.000	0.720	0.810	0.765	1.000

(continued)

Countries	OPN	DSI	EXC	DST	EVI	EVI RS
St Vincent/Grenadines	0.414	0.328	0.668	0.077	0.372	0.370
Samoa	0.346	0.481	0.744	1.000	0.643	0.804
São Tomé & Príncipe	0.281	0.485	0.691	0.000	0.364	0.359
Saudi Arabia	0.399	0.148	0.938	0.002	0.372	0.370
Senegal	0.305	0.587	0.425	0.002	0.330	0.304
Serbia	0.408	0.260	0.396	0.001	0.266	0.202
Seychelles	1.000	0.535	0.731	0.009	0.569	0.686
Sierra Leone	0.236	0.742	0.520	0.000	0.375	0.375
Singapore	1.000	0.356	0.596	0.000	0.488	0.557
Slovak Republic	0.737	0.215	0.704	0.006	0.415	0.441
Slovenia	0.621	0.217	0.508	0.003	0.337	0.315
Solomon Islands	0.483	0.463	0.722	0.033	0.425	0.456
South Africa	0.259	0.255	0.508	0.007	0.257	0.187
Spain	0.252	0.333	0.448	0.018	0.263	0.197
Sri Lanka	0.225	0.392	0.375	0.026	0.254	0.183
Sudan	0.137	0.277	0.842	0.005	0.315	0.280
Suriname	0.423	0.370	0.290	0.000	0.271	0.209
Swaziland	0.692	0.280	0.600	0.015	0.397	0.411
Sweden	0.438	0.245	0.450	0.002	0.284	0.230
Switzerland	0.401	0.136	0.461	0.006	0.251	0.177
Syria	0.258	0.362	0.676	0.000	0.324	0.294
Taiwan	0.574	0.293	0.655	0.000	0.381	0.385
Tajikistan	0.422	0.373	0.600	0.411	0.451	0.498
Tanzania	0.307	0.370	0.534	0.000	0.303	0.260
Thailand	0.537	0.268	0.528	0.041	0.343	0.325
Togo	0.448	0.397	0.481	0.000	0.332	0.306
Tonga	0.352	0.532	0.492	0.145	0.380	0.384
Trinidad & Tobago	0.391	0.523	0.751	0.001	0.417	0.442
Tunisia	0.447	0.256	0.399	0.007	0.277	0.219
Turkey	0.235	0.183	0.555	0.024	0.249	0.174
Turkmenistan	0.564	0.079	0.909	0.004	0.389	0.398
Uganda	0.238	0.302	0.577	0.004	0.280	0.224
Ukraine	0.473	0.490	0.489	0.005	0.364	0.359
United Arab Emirates	0.616	0.138	0.756	0.000	0.377	0.379
United Kingdom	0.293	0.235	0.379	0.005	0.228	0.140
United States	0.121	0.268	0.380	0.015	0.196	0.089
Uruguay	0.251	0.365	0.664	0.003	0.321	0.289
Uzbekistan	0.307	0.176	0.511	0.001	0.249	0.173
Vanuatu	0.504	0.233	0.857	0.365	0.490	0.560
Venezuela	0.198	0.228	0.948	0.008	0.346	0.329
Vietnam	0.657	0.213	0.399	0.051	0.330	0.304
Yemen	0.272	0.639	0.901	0.048	0.465	0.520
Zambia	0.321	0.173	0.849	0.002	0.336	0.314
Zimbabwe	0.530	0.345	0.590	0.012	0.369	0.366

Legend of column headings:
OPN = trade openness
DSI = dependence on strategic imports
EVI = economic vulnerability index
EXN = export concentration
DST = disaster proneness
EVI RS = rescaled economic vulnerability index

2.1b Sources of the EVI data

The data for the indices described below were rescaled using the max–min formula, as explained in endnote 2.

In all, 183 countries were included in the analysis, as shown in Appendix 2.1a. Cuba, Kosovo, Palau, San Marino, Somalia, South Sudan and Timor-Leste are not included in the analysis because of missing data relating to many of the components of the EVI and ERI.

2.1b(i) Trade openness (OPN)

In the present study, trade openness is measured by the average of exports and imports of goods and services as a percentage of GDP. The source of the data was the UNCTAD database, available at: http://unctadstat.unctad.org/TableViewer/tableView.aspx?ReportId=95. The data were averaged over three years, 2009–2011. For a few countries, namely Hong Kong, Liberia, Luxembourg, Seychelles and Singapore, the ratio was capped at 120 per cent, to reduce the distorting effects of outliers when applied to the max–min formula (as indicated in endnote 2).

2.1b(ii) Export concentration (EXN)

The 'export concentration' index is measured by the sum of the three broad groups of exports of goods and services, which together take the highest percentage of total exports of goods and services. This was then expressed as a percentage of total exports of goods and services. The procedure used was to group exports into 14 categories, of which there were 10 broad groups of merchandise, as per SITC one-digit classification, and the remaining four were services grouped under the headings of transport, travel, financial services and other services. The source of the data was the UNCTAD, available at: http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx, under the heading 'International trade in goods and services'. The data were averaged over three years, 2009–2011.

2.1b(iii) Dependence on strategic imports (DSI)

The 'dependence on strategic imports' index is measured by the imports of food and fuel as a percentage of total merchandise imports. The source of the data was the UNCTAD database, available at: unctadstat.unctad.org/ReportFolders/reportFolders.aspx, under the heading 'International trade in goods and services'. The variables were averaged over three years, 2009–2011.

2.1b(iv) Proneness to natural disasters (DST)

The disaster proneness index was measured in terms of economic damage relative to GDP. The source of the data was the EM-DAT Database, available at: www.emdat.be/database, covering a period of about three decades (1980–2011).

2.1b(v) The vulnerability index (EVI and EVI RS)

The EVI was computed as a weighted average of the four components described above. The weighting scheme is explained in the main body of this study, also shown

as Weighting Scheme 1 in the following table. EVI RS shown in Appendix 2.1a means that the EVI was rescaled again to present the results within the range of 0 to 1.

Other weighting schemes were tested to examine how different weights affect the index. The different weighting schemes used are presented in the following table.

Table A2.1.2 Alternative EVI weighting schemes

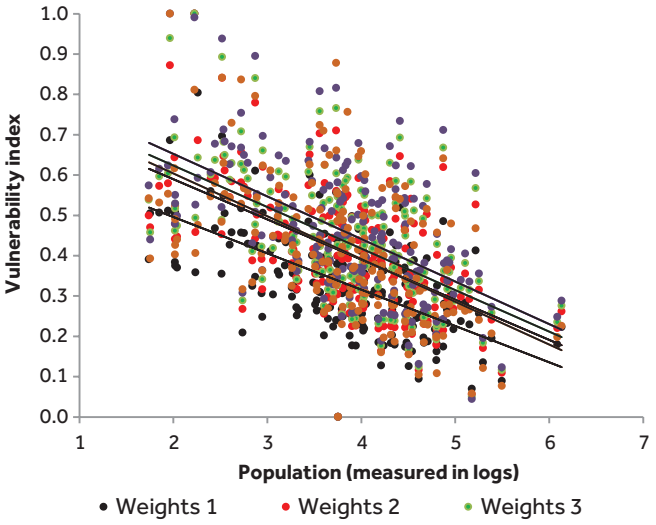
Index	Weighting schemes				
	1	2	3	4	5
Trade openness	0.250	0.300	0.317	0.333	0.500
Export concentration	0.250	0.300	0.317	0.333	0.250
Dependence on strategic imports	0.250	0.300	0.317	0.333	0.250
Proneness to natural disasters	0.250	0.100	0.050	0.000	0.000
Total	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**

The different weighting schemes produced different EVIs, but in all cases there was a tendency for small states to exhibit higher vulnerability scores, as indicated by the fitted lines shown in Figure A2.1.1. Each fitted line shows the relationship between country size (measured by the log of the population size) and economic vulnerability.

Weighting Scheme 1:	$EVI_1 = .6763 - .0901\ P$	$R^2 = .3469$
Weighting Scheme 2;	$EVI_2 = .7887 - .0996\ P$	$R^2 = .3271$
Weighting Scheme 3:	$EVI_3 = .8293 - .1030\ P$	$R^2 = .3144$
Weighting Scheme 4:	$EVI_4 = .8634 - .1055\ P$	$R^2 = .3001$
Weighting Scheme 5:	$EVI_5 = .8160 - .1061\ P$	$R^2 = .3022$

where P is the log of the population size.

Figure A2.1.1 Fitted EVI lines derived from five different weighting schemes



Appendix 2.2 Data for the economic resilience index

2.2a The economic resilience index and its components

(See legend for column headings at the end of the table)

Country	STB	MFX	FNR	GVN	SOC	ENV	ERI RS	Rescaled
Afghanistan	0.616	0.153	0.676	0.000	0.119	0.120	0.315	0.240
Albania	0.548	0.438	0.426	0.414	0.743	0.792	0.505	0.494
Algeria	0.685	0.264	0.506	0.223	0.663	0.461	0.448	0.418
Angola	0.325	0.089	0.500	0.188	0.248	0.442	0.252	0.156
Antigua & Barbuda	0.408	0.686	0.811	0.705	0.696	0.542	0.599	0.619
Argentina	0.413	0.279	0.677	0.393	0.803	0.613	0.430	0.394
Armenia	0.619	0.502	0.639	0.404	0.744	0.440	0.540	0.541
Australia	0.680	0.751	0.934	0.928	1.000	0.615	0.788	0.873
Austria	0.632	0.572	0.698	0.901	0.894	0.851	0.709	0.767
Azerbaijan	0.681	0.528	0.627	0.246	0.702	0.357	0.524	0.520
Bahamas	0.632	1.000	0.977	0.732	0.697	0.527	0.772	0.851
Bahrain	0.688	0.919	0.838	0.470	0.741	0.356	0.694	0.747
Bangladesh	0.631	0.453	0.569	0.234	0.382	0.346	0.463	0.439
Barbados	0.579	0.635	0.850	0.801	0.821	0.377	0.667	0.710
Belarus	0.233	0.608	0.139	0.216	0.776	0.563	0.363	0.305
Belgium	0.551	0.665	0.644	0.851	0.908	0.738	0.684	0.733
Belize	0.513	0.773	0.660	0.449	0.682	0.687	0.593	0.612
Benin	0.630	0.348	0.669	0.386	0.218	0.496	0.478	0.458
Bhutan	0.459	0.241	0.523	0.510	0.303	0.518	0.415	0.374
Bolivia	0.589	0.138	0.591	0.316	0.641	0.576	0.418	0.377
Bosnia & Herzegovina	0.596	0.428	0.518	0.372	0.713	0.235	0.484	0.466
Botswana	0.662	0.656	0.767	0.669	0.429	0.560	0.652	0.690
Brazil	0.510	0.086	0.911	0.498	0.663	0.697	0.454	0.426
Brunei Darussalam	1.000	0.846	0.651	0.670	0.780	0.728	0.831	0.931
Bulgaria	0.595	0.587	0.493	0.527	0.771	0.609	0.580	0.594
Burkina Faso	0.630	0.597	0.643	0.370	0.026	0.132	0.504	0.493
Burundi	0.301	0.539	0.487	0.138	0.163	0.229	0.328	0.257
Cambodia	0.617	0.498	0.565	0.250	0.425	0.590	0.489	0.473
Cameroon	0.699	0.490	0.693	0.216	0.307	0.354	0.498	0.484
Canada	0.576	0.846	0.913	0.928	0.934	0.650	0.773	0.853
Cape Verde	0.479	0.410	0.597	0.621	0.458	0.157	0.483	0.465
Central African Rep.	0.544	0.192	0.623	0.111	0.106	0.395	0.333	0.264
Chad	0.569	0.188	0.729	0.106	0.017	0.221	0.335	0.267
Chile	0.702	0.562	0.780	0.811	0.827	0.591	0.698	0.752
China	0.715	0.386	0.548	0.320	0.623	0.340	0.505	0.494
Colombia	0.614	0.474	0.704	0.386	0.659	0.725	0.544	0.546

(continued)

Country	STB	MFX	FNR	GVN	SOC	ENV	ERI RS	Rescaled
Comoros	0.553	0.166	0.502	0.204	0.256	0.190	0.336	0.268
Congo, Democratic Rep.	0.182	0.361	0.627	0.010	0.137	0.441	0.237	0.136
Congo, Republic	0.442	0.418	0.717	0.180	0.359	0.435	0.395	0.347
Costa Rica	0.546	0.503	0.719	0.644	0.757	0.853	0.600	0.621
Côte d'Ivoire	0.591	0.312	0.713	0.162	0.193	0.557	0.412	0.370
Croatia	0.628	0.436	0.606	0.585	0.787	0.760	0.584	0.600
Cyprus	0.542	0.527	0.570	0.779	0.835	0.626	0.614	0.640
Czech Republic	0.688	0.556	0.763	0.727	0.902	0.772	0.686	0.736
Denmark	0.698	0.778	0.707	0.985	0.918	0.749	0.797	0.885
Djibouti	0.580	0.120	0.000	0.297	0.176	0.070	0.302	0.223
Dominica	0.464	0.638	0.980	0.681	0.690	0.633	0.619	0.646
Dominican Republic	0.511	0.455	0.719	0.371	0.621	0.535	0.490	0.474
Ecuador	0.644	0.191	0.640	0.260	0.690	0.691	0.450	0.420
Egypt	0.434	0.333	0.607	0.284	0.585	0.588	0.407	0.363
El Salvador	0.617	0.352	0.863	0.446	0.616	0.529	0.528	0.525
Equatorial Guinea	0.469	0.146	0.650	0.124	0.224	0.436	0.311	0.235
Eritrea	0.163	0.039	0.367	0.077	0.158	0.266	0.136	0.000
Estonia	0.675	0.603	0.725	0.766	0.869	0.605	0.688	0.739
Ethiopia	0.370	0.614	0.604	0.211	0.168	0.540	0.413	0.372
Fiji	0.548	0.957	0.682	0.297	0.723	0.412	0.608	0.632
Finland	0.695	0.612	0.943	1.000	0.900	0.765	0.778	0.859
France	0.594	0.530	0.772	0.817	0.911	0.853	0.674	0.720
Gabon	0.673	0.704	0.720	0.331	0.531	0.640	0.599	0.619
Gambia	0.375	0.689	0.763	0.329	0.203	0.205	0.454	0.427
Georgia	0.531	0.723	0.558	0.485	0.799	0.620	0.590	0.608
Germany	0.655	0.533	0.653	0.879	0.954	0.813	0.699	0.754
Ghana	0.359	0.493	0.790	0.502	0.494	0.441	0.472	0.450
Greece	0.402	0.295	0.478	0.566	0.881	0.681	0.460	0.434
Grenada	0.383	0.563	0.811	0.585	0.773	0.501	0.535	0.534
Guatemala	0.635	0.307	0.745	0.308	0.425	0.525	0.472	0.450
Guinea	0.191	0.055	0.720	0.133	0.082	0.280	0.185	0.066
Guinea-Bissau	0.369	0.302	0.661	0.164	0.088	0.388	0.315	0.239
Guyana	0.422	0.653	0.649	0.367	0.584	0.427	0.494	0.479
Haiti	0.493	0.563	0.539	0.149	0.312	0.319	0.418	0.378
Honduras	0.555	0.390	0.699	0.305	0.573	0.537	0.470	0.447
Hong Kong SAR	0.789	0.998	0.919	0.874	0.892	0.897	0.883	1.000
Hungary	0.538	0.573	0.641	0.669	0.843	0.625	0.606	0.629
Iceland	0.480	0.808	0.396	0.885	0.947	0.801	0.688	0.739
India	0.502	0.569	0.822	0.384	0.393	0.225	0.497	0.484
Indonesia	0.555	0.326	0.698	0.351	0.537	0.532	0.462	0.436
Iran, Islamic Republic	0.519	0.281	0.590	0.152	0.685	0.349	0.383	0.331
Iraq	0.318	0.161	0.659	0.090	0.463	0.016	0.248	0.150
Ireland	0.654	0.770	0.206	0.879	0.971	0.655	0.713	0.772
Israel	0.593	0.453	0.787	0.646	0.944	0.577	0.604	0.627
Italy	0.491	0.485	0.559	0.616	0.900	0.851	0.565	0.575
Jamaica	0.239	0.614	0.786	0.471	0.720	0.572	0.475	0.454

(continued)

Country	STB	MFX	FNR	GVN	SOC	ENV	ERI RS	Rescaled
Japan	0.361	0.746	0.662	0.823	0.945	0.744	0.639	0.673
Jordan	0.453	0.775	0.708	0.449	0.681	0.338	0.560	0.568
Kazakhstan	0.540	0.576	0.457	0.310	0.714	0.162	0.479	0.460
Kenya	0.522	0.566	0.674	0.279	0.410	0.475	0.483	0.464
Kiribati	0.651	0.385	0.507	0.478	0.582	0.449	0.518	0.512
Korea	0.713	0.380	0.527	0.688	0.956	0.627	0.617	0.644
Kuwait	0.850	0.617	0.635	0.498	0.628	0.212	0.648	0.685
Kyrgyz Republic	0.431	0.489	0.551	0.239	0.637	0.418	0.424	0.385
Lao PDR	0.390	0.137	0.698	0.215	0.406	0.488	0.319	0.246
Latvia	0.576	0.556	0.512	0.653	0.814	0.879	0.613	0.638
Lebanon	0.285	0.601	0.719	0.292	0.675	0.438	0.432	0.396
Lesotho	0.569	0.464	0.644	0.440	0.240	0.009	0.471	0.449
Liberia	0.000	0.203	0.625	0.260	0.281	0.229	0.187	0.069
Libya	0.772	0.006	0.640	0.119	0.718	0.253	0.392	0.343
Lithuania	0.639	0.621	0.644	0.681	0.805	0.786	0.661	0.703
Luxembourg	0.772	0.574	0.879	0.960	0.818	0.856	0.780	0.862
Macedonia, FYR	0.646	0.681	0.647	0.449	0.698	0.430	0.602	0.623
Madagascar	0.437	0.338	0.638	0.265	0.433	0.284	0.380	0.327
Malawi	0.380	0.529	0.786	0.382	0.265	0.440	0.451	0.422
Malaysia	0.711	0.727	0.775	0.567	0.718	0.728	0.689	0.741
Maldives	0.488	0.883	0.201	0.379	0.603	0.188	0.527	0.524
Mali	0.599	0.343	0.570	0.309	0.068	0.137	0.412	0.370
Malta	0.570	0.495	0.868	0.806	0.846	0.460	0.637	0.671
Marshall Islands	0.543	0.432	0.793	0.455	0.608	0.243	0.502	0.491
Mauritania	0.196	0.462	0.449	0.232	0.240	0.000	0.283	0.197
Mauritius	0.558	0.707	0.828	0.702	0.650	0.586	0.654	0.693
Mexico	0.604	0.404	0.776	0.431	0.739	0.471	0.530	0.527
Micronesia	0.607	0.234	0.746	0.491	0.611	0.124	0.472	0.450
Moldova	0.503	0.372	0.505	0.385	0.650	0.397	0.446	0.416
Mongolia	0.437	0.557	0.388	0.418	0.650	0.400	0.468	0.445
Montenegro	0.458	0.611	0.608	0.505	0.806	0.683	0.549	0.553
Morocco	0.623	0.336	0.673	0.392	0.444	0.407	0.482	0.463
Mozambique	0.435	0.140	0.637	0.385	0.021	0.447	0.344	0.279
Myanmar	0.417	0.125	0.757	0.025	0.335	0.541	0.287	0.203
Namibia	0.683	0.623	0.801	0.567	0.448	0.502	0.629	0.660
Nepal	0.570	0.373	0.493	0.224	0.320	0.641	0.427	0.390
Netherlands	0.695	0.651	0.709	0.951	0.951	0.788	0.761	0.836
New Zealand	0.664	0.897	0.893	0.984	0.999	0.796	0.838	0.939
Nicaragua	0.374	0.460	0.619	0.304	0.538	0.665	0.426	0.388
Niger	0.554	0.147	0.537	0.288	0.000	0.027	0.333	0.264
Nigeria	0.610	0.505	0.620	0.153	0.252	0.300	0.446	0.415
Norway	0.698	0.454	0.912	0.968	0.997	0.870	0.741	0.809
Oman	0.691	0.847	0.840	0.520	0.573	0.374	0.680	0.728
Pakistan	0.451	0.351	0.696	0.150	0.333	0.289	0.364	0.306
Panama	0.589	0.389	0.785	0.499	0.747	0.641	0.547	0.550
Papua New Guinea	0.630	0.874	0.491	0.287	0.227	0.294	0.560	0.568
Paraguay	0.616	0.285	0.684	0.298	0.627	0.535	0.464	0.439
Peru	0.669	0.556	0.765	0.410	0.701	0.494	0.583	0.599
Philippines	0.634	0.443	0.747	0.344	0.616	0.630	0.530	0.527
Poland	0.613	0.582	0.726	0.704	0.809	0.747	0.653	0.692

(continued)

Country	STB	MFX	FNR	GVN	SOC	ENV	ERI RS	Rescaled
Portugal	0.527	0.379	0.574	0.736	0.783	0.635	0.560	0.568
Qatar	0.737	0.872	0.862	0.663	0.674	0.423	0.743	0.813
Romania	0.518	0.547	0.577	0.506	0.786	0.457	0.539	0.539
Russia	0.588	0.345	0.465	0.268	0.754	0.401	0.444	0.413
Rwanda	0.498	0.847	0.692	0.410	0.245	0.342	0.563	0.571
St Kitts and Nevis	0.257	0.506	0.659	0.715	0.675	0.457	0.487	0.470
St Lucia	0.270	0.713	0.795	0.712	0.683	0.660	0.565	0.575
St Vincent/ Grenadines	0.351	0.608	0.677	0.711	0.682	0.539	0.549	0.553
Samoa	0.595	0.692	0.661	0.564	0.731	0.226	0.604	0.626
São Tomé & Príncipe	0.056	0.104	0.065	0.357	0.399	0.247	0.163	0.037
Saudi Arabia	0.690	0.857	0.802	0.378	0.692	0.488	0.660	0.702
Senegal	0.448	0.216	0.694	0.376	0.282	0.426	0.384	0.332
Serbia	0.578	0.336	0.486	0.435	0.766	0.197	0.467	0.443
Seychelles	0.357	0.485	0.691	0.526	0.744	0.680	0.492	0.476
Sierra Leone	0.474	0.476	0.715	0.281	0.100	0.238	0.419	0.379
Singapore	0.609	0.876	0.946	0.901	0.852	0.610	0.782	0.865
Slovak Republic	0.571	0.554	0.705	0.686	0.840	0.807	0.631	0.663
Slovenia	0.677	0.464	0.460	0.731	0.936	0.723	0.635	0.667
Solomon Islands	0.481	0.556	0.744	0.349	0.388	0.291	0.475	0.454
South Africa	0.643	0.504	1.000	0.542	0.438	0.193	0.579	0.593
Spain	0.596	0.400	0.488	0.721	0.909	0.686	0.588	0.605
Sri Lanka	0.542	0.510	0.803	0.378	0.720	0.598	0.532	0.531
Sudan	0.298	0.259	0.540	0.025	0.139	0.412	0.245	0.146
Suriname	0.561	0.525	0.670	0.443	0.596	0.571	0.535	0.534
Swaziland	0.610	0.659	0.698	0.312	0.303	0.244	0.525	0.521
Sweden	0.727	0.639	0.893	0.983	0.942	0.849	0.794	0.881
Switzerland	0.728	0.848	0.830	0.960	0.922	1.000	0.844	0.947
Syria	0.538	0.400	0.101	0.132	0.570	0.350	0.368	0.311
Taiwan	0.794	0.468	0.698	0.748	0.956	0.723	0.699	0.754
Tajikistan	0.381	0.375	0.315	0.161	0.626	0.274	0.333	0.264
Tanzania	0.509	0.393	0.663	0.360	0.317	0.570	0.452	0.424
Thailand	0.662	0.400	0.717	0.392	0.605	0.680	0.539	0.539
Togo	0.509	0.223	0.424	0.223	0.342	0.463	0.355	0.293
Tonga	0.570	0.690	0.803	0.482	0.743	0.430	0.601	0.622
Trinidad & Tobago	0.724	0.591	0.745	0.509	0.646	0.432	0.624	0.653
Tunisia	0.598	0.617	0.640	0.414	0.650	0.425	0.558	0.566
Turkey	0.494	0.371	0.750	0.461	0.612	0.389	0.478	0.458
Turkmenistan	0.585	0.203	0.367	0.089	0.622	0.139	0.338	0.271
Uganda	0.498	0.725	0.746	0.313	0.296	0.341	0.514	0.506
Ukraine	0.461	0.264	0.249	0.318	0.749	0.418	0.376	0.322
United Arab Emirates	0.723	0.863	0.769	0.615	0.706	0.506	0.725	0.788
United Kingdom	0.612	0.802	0.530	0.860	0.861	0.849	0.734	0.801
United States	0.544	0.851	0.673	0.826	0.969	0.615	0.722	0.784
Uruguay	0.494	0.500	0.743	0.698	0.775	0.624	0.584	0.600
Uzbekistan	0.469	0.157	0.367	0.116	0.640	0.148	0.295	0.214
Vanuatu	0.660	0.604	0.948	0.541	0.539	0.335	0.617	0.643
Venezuela	0.343	0.000	0.640	0.119	0.692	0.596	0.266	0.174

(continued)

Country	STB	MFX	FNR	GVN	SOC	ENV	ERI RS	Rescaled
Vietnam	0.489	0.282	0.407	0.323	0.560	0.501	0.398	0.351
Yemen	0.468	0.321	0.603	0.098	0.242	0.211	0.333	0.265
Zambia	0.494	0.476	0.810	0.395	0.252	0.595	0.486	0.469
Zimbabwe	0.414	0.179	0.638	0.064	0.330	0.542	0.298	0.218

Legend of column headings:
STB = macroeconomic stability
FNR = financial riskiness
ENV = environmental management
ERI = economic resilience index
MFX = market flexibility
SOC = social development
POP = population size measured in logs
ERI RS = rescaled economic resilience index

2.2b Sources of the ERI data

The data for the indices described below were rescaled using the max–min formula, as explained in endnote 2. In the case of inflation and the debt/GDP ratio, the formula was subtracted from 1, as these variables are undesirables with regard to economic stability.

In all, 183 countries were included in the analysis, as shown in Appendix 2.1a. Cuba, Kosovo, Palau, San Marino, Somalia, South Sudan and Timor-Leste are not included in the analysis because of missing data relating to many of the components of the EVI and ERI.

2.2b(i) Macroeconomic stability (STB)

The 'macroeconomic stability' component of the resilience index (STB) is composed of three variables, namely (i) government debt as a percentage of GDP; (ii) inflation measured by the GDP deflator; and (iii) current account balance, equally weighted. The raw data were mostly sourced from the IMF World Economic Outlook Database, available at: www.imf.org/external/pubs/ft/weo/2013/02/weodata/index.aspx.[88]

The data were averaged over a ten-year period (2003–2012), to reduce the effects of cyclical fluctuations.

2.2b(ii) Market flexibility (MFX)

The raw data were sourced from the (a) labour market regulations and (b) business regulations forming part of the 'regulation' major area of the Economic Freedom of the World Index (EFWI), available at: www.freetheworld.com/2013/EFWdataset2013.xls. The two indices were averaged, covering a period of three years (2010–12).

Data were available for 152 countries. Data for the remaining 31 countries[89] were obtained as follows. The EFWI regulation component draws heavily on the World Bank's Doing Business Index (DBI), and it was therefore decided to fill in the data gaps by multiplying the DBI scores for the countries with missing data by a ratio aimed at transforming the DBI scores into 'market flexibility' scores. The ratio was calculated as follows: the gap between a country's actual DBI score and the highest DBI score was expressed as a ratio of the range of the DB ranking scores (totalling

189). This ratio was than multiplied by the gap between the lowest (3.65) and the highest (8.86) 'market flexibility' scores. The result for each country was added to the lowest 'market flexibility' score (3.65). The DBI data were sourced from www.doingbusiness.org/rankings.

2.2b(iii) Financial riskiness (FNR)

The 'financial riskiness' (FNR) index is composed of (a) 'lack of financial prudence' weighted by (b) the 'importance of the financial sector'.

Lack of financial prudence

To measure 'lack of financial prudence' two indices derived from the Global Competitiveness Indicators (GCI) were used. These were 'soundness of banks' and 'regulation of securities exchanges'. The data was derived from the Executive Opinion Survey of the World Economic Forum. The data were averaged for five years, as from 2008–09 to 2013–14, and are available at: www.weforum.org/issues/competitiveness-0/gci2012-data-platform. The indicators included in the Global Competitiveness Indicators (GCI) are measured along a seven-point scale. Given that the indicators used in this study convey opposite condition, a score of, say, 5 on the 'soundness of banks' was assigned a score of 2 on the 'unsoundness of banks' index. The same applies to the 'lack of regulation of securities exchanges' index.

The GCI do not cover all the 183 countries included in the resilience index.[90] The missing country data was filled in using a ratio method, utilising the World Bank's 'strength of legal rights' index.[91] The 'strength of legal rights' index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending, with higher scores indicating that these laws are better designed to expand access to credit. The data was averaged over 2008 to 2012. The procedure used to obtain the missing country data for the 'financial prudence' index was to divide the missing country data on 'strength of legal rights' by 10 and multiply the result by 7. The reason for this is that the 'financial prudence' index is constructed on a seven-point scale, while the 'strength of legal regal rights' index is constructed on a ten-point scale.

Importance of the financial sector

The 'lack of financial prudence' index was weighted by another index that measures the 'depth of the financial sector' in an economy. This was measured by the 'bank private credit to GDP (%)' index, available at: siteresources.worldbank.org/EXTGLOBALFINREPORT/Resources/8816096-1346865433023/8827078-1347152290218/GFDD_V16_April_2013_20130404.xlsx

This index relates to the financial resources provided to the private sector by domestic banks and other financial institutions. The data was averaged over four years, 2008 to 2011.

This index also had some missing data for the following countries. Eritrea, Kiribati, Kyrgyz Republic, Marshall Islands, Micronesia, Norway, Rwanda, Taiwan, Tajikistan, Turkmenistan, Uzbekistan and Zimbabwe. Data for these countries were approximated with reference to official literature on the countries and comparator countries.

The 'bank private credit to GDP (%)' was measured in logs to allow for the diminishing marginal effect of the size of the financial sector, which is used as a weight for the 'trustworthiness and confidence' index.

The resultant product of the 'lack of financial prudence' and the 'financial depth' indices was rescaled using the max–min index to construct a 'financial riskiness' index.

2.2b(iv) The adjusted market flexibility index (AMFX)

The AMFX is a combination of (a) the 'market flexibility' index in the labour and goods markets (MFX) with a weight of 75 per cent and (b) 1-FNR, which is labelled the 'financial safety' index as the obverse of the 'financial riskiness' index, given that the latter index has a value of between 0 and 1.

2.2b(v) Political governance

To construct the governance index (GVN), the Worldwide Governance Indicators database – published by the World Bank – was utilised.[92] The indicators have six dimensions of governance, namely (i) voice and accountability; (ii) political stability and absence of violence; (iii) government effectiveness; (iv) regulatory quality; (v) rule of law; and (vi) control of corruption. The WGI assigns scores of approximately –2.5 to 2.5, with higher values corresponding to better governance. A detailed description of the methodology is given in Kaufmann et al. (2010).

The data used for the purpose of the study presented in this chapter was averaged over the six dimensions of the WGI indicators and again averaged over three years (2009 to 2011). The data was rescaled using the max–min approach to render the data comparable across sources.

2.2b(vi) Social development (SOC)

The social development index was sourced from the non-income components of the Human Development Index, which relate to education and health. Education is measured by (a) mean years of schooling and (b) expected years of schooling, while health is measured by life expectancy at birth. The data covered three years (2010 to 2012).[93]

The only missing data observation pertained to Taiwan. It was decided not to exclude this country from the analysis because of one missing data point, and the score to Taiwan was assumed to be similar to that of South Korea.

2.2b(vii) Environment management (ENV)

The environmental management (ENV) index was based on the environment performance index (EPI), available at: epi.yale.edu. The 2012 EPI ranks 132 countries

in terms of two broad policy objectives, namely (i) environmental health (EH), which measures environmental stresses to human health, covering the first three policy categories; and (ii) ecosystem vitality (EV), which measures ecosystem health and natural resource management, covering the remaining seven policy categories. The EH objective was given a weight of 30 per cent, while the EV objective was given a weight of 70 per cent.

The EPI excludes a number of countries, mostly small states. In order to fill the data gaps, the regression method was used to determine which variables systematically related to the 'environmental health' (EH) index and the 'ecosystem vitality' (EV) index for the countries for which data was available.

The estimated EH index for countries with missing data

In the case of the EH index, there were 12 out of 183 countries with missing data.[94] The 'least squares' multiple regression method was applied to the 171 countries with available data to extrapolate the scores for countries with missing data. The available values of the EH index were used as dependent variables, and four variables were used as relevant explanatory variables, namely (i) GDP per capita, based on the assumption that environmental management with regard to health effects becomes more affordable as countries develop;[95] (ii) primary production as a ratio of GDP,[96] based on the assumption that such dependence has negative impacts on the environment and therefore on health; (iii) government effectiveness,[97] based on the assumption that such effectiveness is conducive to environmental health; and (iv) child mortality, as this was one of the variables used to construct the EPI-EH index, which was also available for most countries with missing data. The results indicated that the estimates of the equation coefficients where highly statistically significant at the 95 per cent level. The correlation coefficient R^2 was 0.934.

The estimated EH equation was as follows:

$$\begin{array}{lccccc} \text{EH} = 16.054 & + & 0.310\,\text{GC} & + & 2.509\,\text{GE} & + & 0.688\,\text{CM} & - & 0.146\,\text{AD} \\ t\ \textit{stats}: \quad 5.84 & & 4.89 & & 2.48 & & 19.91 & & -2.44 \end{array}$$

$$R^2 = 0.934;\ N = 171 \text{ countries}$$

where EH is the 'environmental health' index; GC is GDP per capita in US dollars (thousands); AD is agriculture dependence, measured as a ratio of GDP; GE is government effectiveness, measured as an index between –2.5 and +2.5; and CM is child mortality.

Data for the explanatory variables were available for the 12 countries with the missing EH scores,[98] and the estimated coefficients were then used to estimate the EH index for these 12 countries.

The estimated EV index for countries with missing data

The procedure was repeated to estimate the missing values of EV index. There were 51 out of 183 countries with missing data.[99] The least squares multiple regression method was applied to the 132 countries with available data to extrapolate the scores

of countries with missing data. This time the explanatory variables that were found to be relevant and statistically significant were the following: (i) OP, which stands for production of oil as a ratio of land area (measured in logs to allow for diminishing marginal effect), on the assumption that oil production is detrimental to ecosystem health and natural resource management;[100] and (ii) BP, which stands for biome protection, is a component of the EPI-EV index and is available for countries with missing data. In addition, the EPI-EV index for the countries with available data included two dummy variables (with values of 1 if yes and 0 if no), which were also available for countries with missing data. These were (i) NF, which stands for lack of forests (because the forests variable is not relevant for countries with less than 100 km^2 of forestland) and (ii) NE, which stands for minimal use of electricity (because, for countries that generate less than 130 kWh of electricity annually, renewable electricity usage is not relevant in the climate change policy variable).[101]

The results indicated that the estimates of the equation coefficients were statistically significant at the 95 per cent level.

The estimated EV Index equation was as follows:

$$EV = 36.05 - 1.294\ OP + 0.197\ BP - 12.898\ NF + 8.822\ NE$$
$$t\ stats: 23.576 \quad -2.537 \quad 9.991 \quad -6.265 \quad 3.816$$
$$R^2 = 0.654;\ N = 132 \text{ countries.}$$

Data for the explanatory variables were available for the 51 countries with the missing data, and the estimated coefficients were used to estimate the EV scores for these countries.

The ENV index

The values of EH and EV, including the estimated scores for the countries with missing data, were then respectively multiplied by 0.3 and 0.7, which are the weights specified by the authors of the EPI for these components, to produce EPI scores. These were then rescaled using the max–min formula, and used to construct the ENV index for the purpose of this study. The results are shown in Appendix 2.2a.

2.2b(viii) The economic resilience index (ERI and ERI RS)

The ERI was computed by multiplying the rescaled components by a weighting scheme explained in the main body of this study, shown as Weighting Scheme 1 in Table A2.2.2.

Other weighting schemes were tested to assess how different weights affect the index, as shown in the following table. It should be noted that Weighting Scheme 4 is the same as used by Briguglio et al. (2009).

As expected, the weighting schemes produced different ERIs. However, in all cases the fitted line between the ERI and population size had a negative gradient, but there was no significant relationship between the ERIs and the size of countries shown

Table A2.2.2 Alternative ERI weighting schemes

Index	Weighting schemes				
	1	2	3	4	5
Macroeconomic stability	**0.333**	**0.250**	**0.333**	**0.250**	**0.167**
Market flexibility (adjusted)	**0.333**	**0.250**	**0.333**	**0.250**	**0.333**
Market flexibility	0.250	0.200	0.222	0.250	0.167
Financial riskiness	0.083	0.050	0.111	0.000	0.167
Governance	**0.333**	**0.500**	**0.333**	**0.500**	**0.500**
Political governance	0.222	0.250	0.222	0.250	0.167
Social development	0.056	0.125	0.056	0.250	0.167
Environmental management	0.056	0.125	0.056	0.000	0.167

in the diagram below. As explained in the main body of this chapter, there was an indication that the ERI is correlated with GDP per capita.

Equations for the fitted line:

Weighting Scheme 1:	$ERI_1 = 0.6511 - 0.0365\ P;$	$R^2 = 0.0244$
Weighting Scheme 2:	$ERI_2 = 0.6406 - 0.0360\ P;$	$R^2 = 0.0211$
Weighting Scheme 3:	$ERI_3 = 0.6472 - 0.0348\ P;$	$R^2 = 0.0227$
Weighting Scheme 4:	$ERI_4 = 0.7016 - 0.0455\ P;$	$R^2 = 0.0309$
Weighting Scheme 5:	$ERI_4 = 0.6140 - 0.0302\ P;$	$R^2 = 0.0015$

where P is the log of the population size.

Figure A2.2.1 Fitted ERI lines derived from four different weighting schemes