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Subgrouping Small States Based on Socioeconomic Characteristics

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Summary. — Developing small states are often discussed as a whole because of shared vulnerabilities, but could instead be treated according to their different socioeconomic characteristics. This paper investigates those differences and subgroups them through the use of statistical methods. Seven common factors were first extracted from 25 key socioeconomic indicators. Cluster analysis based on factor scores was then used to obtain distinct clusters of small states. Nine well-delineated clusters were thus obtained, each of which containing small states with similar characteristics. Managerial implications for international aid based on the findings are then proposed. © 2002 Elsevier Science Ltd. All rights reserved.

Key words — small states, vulnerability, aid, cluster analysis, factor analysis

1. INTRODUCTION

Developing small states have clearly shown to be a very heterogeneous group in relation to per capita GNP and in per capita GDP growth (Advisory Board to the Joint Commonwealth Secretariat/World Bank Task Force, 1999). Nevertheless, developing small states are often discussed as a collective whole or in terms of regional groupings because they share a number of characteristics that pose special development challenges, especially their vulnerability to external events or shocks, be it economic or natural disasters. The vulnerability of small states has long drawn the international community's attention and is taken into account in the policies and programs of the international multilateral trade and finance organizations (IMF/World Bank Group, 2000). For instance, the graduation policies of the international financial institutions have paid more explicit attention to the acute vulnerability of their smaller members in view of helping vulnerable countries achieve greater resistance to external shocks. In addition, specific action plans have been proposed to assist small states in tackling development challenges (IMF/World Bank Group, 2000). But as there rarely is a "one size fits all" strategy or solution, it may be helpful to subgroup small states according to their specific needs so that development can be managed more effectively and economically.

International organizations classify countries according to regions, per capita income, levels of development progress, and indebtedness. The human development index (HDI) developed by the United Nations Development Program (UNDP) in 1990 measures the development progress of a country in terms of basic human levels and produces a ranking of all countries in the world (UNDP, 2000). Countries are classified in four ways in the Human

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Development Report: by major world classification, by region, by human development level, and by income (UNDP, 2000). [1] The UN designates another two classifications for the purpose of attacking poverty while preventing abuses by the global financial system that may impede the progress of least developed countries (LLDCs) and highly indebted poor countries (HIPCs). The LLDCs are designated using multiple criteria including low income, weak human resources, and a low level of economic diversification (UNCTAD, 2001) while HIPCs are qualified for external debt relief by international aid institutions.

As a step toward concerted international action for development, the Development Assistance Committee (DAC) of the OECD started in 1998 to use a core set of indicators to track the progress of development goals in the developing world up to 2015 (OECD, 2000). Instead of producing scores for individual countries, aid recipient countries were then grouped into quintiles according to their relative distances to the goal projections based on the selected indicators. Other than the UNDP's HDI, several vulnerability indices based on the vulnerability of small states have recently been developed by international institutions to reflect relative economic and ecological susceptibility to exogenous shocks (Atkins, Mazzi, & Easter, 2000; Briguglio, 1995; Crowards, 2000; United Nations, 2000). Although these composite vulnerability indices are different, they broadly give similar results (Commonwealth Secretariat/World Bank Joint Task Force, 2000). They provide a direct means of comparing small states that have a wide variety of different characteristics, which is also applicable to least developed and other developing countries (Guillaumont, 1999). Both the HDI and the vulnerability indices combine a number of separate variables to form their respective single indices, which are used to measure the characteristics of a country in relation to its development progress or vulnerability.

It is necessary, however, to look deeper into the characteristics of these small states to achieve more effective and economic planning of international aid. Simply observing these composite indices may not be sufficient. One way to achieve that purpose is to extract common underlying factors based on important socioeconomic indicators, and then appropriately subgroup the small states into mutually exclusive and exhaustive clusters such that small states within the same cluster share similar socioeconomic characteristics while different clusters present dissimilar characteristics.

The groups constructed can form a basis for more effective resource allocation. This process will be discussed in this paper. Section 2 provides a brief review of the important socioeconomic characteristics of small states and the corresponding indicators used by international organizations. Most of these will be used in the following sections for further analysis. In Section 3, factor analysis is used to extract common factors from 25 socioeconomic indicators. Each factor is labeled according to its corresponding intercorrelated indicators. The development features of small states are then summarized. Section 4 uses cluster analysis based on the factor-based scores derived in the previous section to group heterogeneous small states in such a way that states within the same cluster are more alike than those from different clusters. The socioeconomic features of each cluster are then examined. Section 5 discusses the results as well as managerial implications for international aid. Conclusions and suggestions for future research are provided in Section 6.

2. DEFINITION OF SMALL STATES AND THEIR SOCIOECONOMIC CHARACTERISTICS

(a) *Definition of small states*

There is no consistent conceptualization or measurement of small countries. Four principal economic and geographic indicators have been used to measure small size, including population size (e.g., Armstrong, Jouan de Kervenoael, Li, & Read, 1996, 1998; Armstrong & Read, 1998, 2000; Chenery & Syrquin, 1975; Chenery & Taylor, 1968; Hein, 1985; Kuznets, 1960; UNIDO, 1979), geographical area (e.g., Jalan, 1982; Lloyd & Sundrum, 1982), GDP/GNP related indicators, and the terms of trade (described in Read, 2001). Several studies have also attempted to capture different aspects of small size by creating composite measures of two or more variables (Downes, 1988; Jalan, 1982; Taylor, 1969). All of the size variables are continuous and arbitrary breaks tend to be imposed without any underlying theoretical justification (Read, 2001). Population is the best available measure of size in terms of information content and ease of conceptualization (Read, 2001), and it is currently used by

United Nations related institutes (e.g., UNIDO and the World Bank) and other international development institutes (e.g., The Commonwealth Secretariat). As this paper addresses managerial and policy issues for international institutions on the provision of aid to small states, we use the population conceptualization of small size that is currently used by international development institutions.

There is no special significance in the selection of a particular population threshold to define small states. Kuznets (1960), Chenery and Taylor (1968) and Chenery and Syrquin (1975) used an upper limit of between 10 and 15 million people. UNIDO (1979), based upon a hierarchical clustering algorithm grouping countries, proposed a threshold of 20 million. Other empirical research adopted upper limits of one million (Hein, 1985), three million (Armstrong, Johnes, Johnes, & MacBean, 1993; Armstrong *et al*., 1998) and five million (Collier & Dollar, 1999) persons. The Commonwealth Secretariat used a threshold of one million in its 1985 report on small states (Commonwealth Consultative Group, 1985) while a revised upper limit of 1.5 million was used in the 1997 report (Commonwealth Advisory Group, 1997) as the new cut-off mark. Larger member-countries (Jamaica, Lesotho, and Papua New Guinea) that share many of the characteristics of small states are also included in the 1997 report. The Commonwealth Secretariat/World Bank Joint Task Force (2000) then used the 1.5 million population threshold as a convenient yardstick to classify all small states and identified 45 developing countries as small at the small states conference held in St. Lucia in 1999.

Using the number of small states defined by the Commonwealth Advisory Group (1997) and the Commonwealth Secretariat/World Bank Joint Task Force (2000), there are 49 developing small states in the world in total. It is clear from Table 1 that these small states are spread across different regions and levels of human development. Most small states rank in the list of medium human development; 15 of them are designated as LLDCs while four as HIPCs. Furthermore, it is important to notice that a significant number included in the sample, 32 out of the 49 small states, are small island countries. Islandness has been regarded as having a negative impact on the economic growth of small sates because of remoteness/isolation coupled with transport costs (Armstrong *et al*., 1996, 1998; Armstrong & Read, 2000).

(b) *Socioeconomic characteristics/indicators of small states*

In comparison to many developing countries, small states exhibit an enviable record of economic performance (Armstrong *et al*., 1998; Easterly & Kraay, 1999). They are widely viewed as having greater openness to change, and greater ability to gain from international trade (Armstrong *et al*., 1998; Ashoff, 1989; Marcy, 1960; Scitovsky, 1960; Srinivasan, 1986). On the other hand, small states face development challenges and are disadvantaged compared to larger states (e.g., Armstrong *et al*., 1998; Briguglio, 1995; Commonwealth Advisory Group, 1997; Commonwealth Consultative Group, 1985; Demas, 1965). The characteristics that have important implications in the development of small states were identified as openness, insularity (or remoteness and isolation), security weakness, dependence on external capital, susceptibility to natural disasters and environmental change, limited diversification, poverty, and limited capacity (Commonwealth Advisory Group, 1997; Commonwealth Secretariat/World Bank Joint Task Force, 2000). Each of the newly developed vulnerability indices captures many aspects of vulnerability in one indicator that helps to characterize small states. The composite vulnerability index developed by Briguglio (1995) is constructed by using the variables that are highly significantly related to income volatility, including economic exposure, remoteness and insularity, and susceptibility to environmental events and hazards. The Commonwealth vulnerability index, developed by the Commonwealth Secretariat, tests 29 variables representing the economic, environmental, and spatial dimensions of developing countries in an econometric modeling excise in order to identify highly significant indicators influencing vulnerability (Atkins *et al*., 2000). All sources of vulnerability of small states and the corresponding indicators tested in the process of constructing the Commonwealth vulnerability index are listed in Table 2. Out of these indicators, output volatility (measured by the standard deviation of annual growth rates of constant price per capita GDP) is used to determine the factors that might lead to vulnerability. Export dependence, merchandise export diversification, and vulnerability to natural disasters, which were found to be statistically significant and used to form the weights in the model, were used to build the vulnerability index.

Table 1. *Small states grouped by region and level of human development*[a]

Level of human development	High		Medium		Low	
	Country	CVI	Country	CVI	Country	CVI
Africa			Botswana	10.2	Djibouti(1)	8.0
			Swaziland	9.6	Gambia(1)(2)	9.3
			*São Tomé & Principe(1)(2)	7.7	Guinea–Bissau(1)(2)	–
			Equatorial Guinea(1)	7.0		
			Namibia	6.5		
			Gabon	6.2		
			Lesotho(1)	6.0		
			*Comoros(1)	5.4		
			*Cape Verde(1)	5.0		
Caribbean	*Barbados	5.7	*Dominica	8.1		
	*Bahamas	10.4	*Guyana(2)	8.0		
	*Antigua and Barbuda	11.2	*Grenada	7.8		
			*Jamaica	7.5		
			*St. Lucia	7.4		
			Belize	6.7		
			*St. Vincent and the Grenadines	6.6		
			*St. Kitts & Nevis	6.4		
			*Trinidad & Tobago	5.3		
			Suriname	5.0		
Pacific	Brunei	–	*Vanuatu(1)	13.3		
			*Tonga	10.4		
			*Fiji	8.9		
			*Kiribati(1)	5.1		
			*Solomon Islands(1)	8.4		
			*Samoa(1)	7.4		
			Papua New Guinea	6.3		
Indian Ocean			*Maldives(1)	8.7		
			*Mauritius	6.5		
			*Seychelles	6.4		
Other Asia	Bahrain	7.7				
	Bhutan(1)	5.4				
Mediterranean	*Malta	6.9				
	*Cyprus	5.5				
	Qatar	–				
	Estonia	–				

Sources: Level of Human Development, UNDP (available on the Internet); CVI, Commonwealth Secretariat/World Bank Joint Task Force 2000.

[a] Other small developing countries such as *Cook Island, *Marshall Islands, *Micronesia, F. States of *Nauru, *Niué, *Palau, and *Tuvalu are not included due to data constraints. Numbers in the parentheses denoted (1) and (2) represent LLDC and HIPC; *represents small island states. CVI: composite vulnerability index developed by the Commonwealth Secretariat/World Bank Joint Task Force.

It was found that small states are generally more vulnerable than large countries as shown in Figure 1, which was drawn by using the composite vulnerability indices developed by the Commonwealth Secretariat (Easter, 1998).

The composite vulnerability index reflects relative economic and ecological susceptibility to exogenous shocks, while the UNDP's HDI and the OECD's core indicators focus on human well-being rather than economic trends. Indicators used in HDI are life expectancy at birth, adult literacy, gross primary, secondary and tertiary enrollment, and GDP per capita (purchasing power parity in US$, or PPP US$).

Table 2. *Characteristics of small states and major indicators used in developing the composite vulnerability index*

Characteristics of small states	Indicators used in composite vulnerability index
Measurement of vulnerability	Income volatility index (standard variation of annual rates of growth of constant price per capita GDP)
Openness or economic exposure	Trade openness; export dependence; export concentration index Capital openness and the degree of access to or reliance on external financial resource flows; Dependence on the nonmanufacturing sectors; dependence on imports of commercial energy
Remoteness and isolation	Transport cost
Susceptibility to natural disasters and environmental changes	Vulnerability index of natural disasters
Limited diversification	Diversification in production and exports Share of major export merchandise to total exports
Limited capacity	Share of manufacturing and modern private services
Access to external capital	Foreign direct investment; official development aid; external debt
Small size of economy	Not included
Limited resources base	Not included
Narrowness of domestic production structure	Export earnings instability
Poverty	Real per capita GDP (purchasing power parity US$)

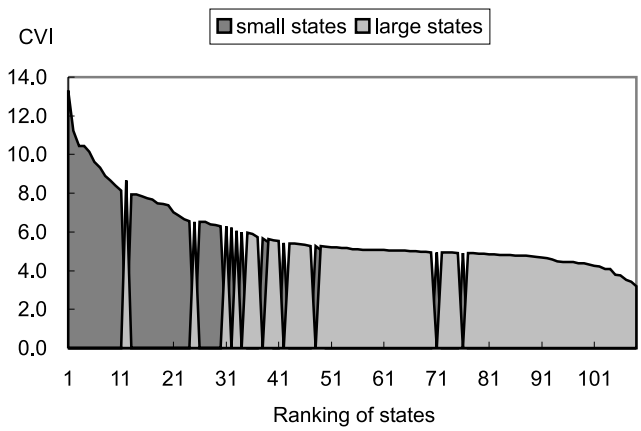

Figure 1. *117 countries ranked by composite vulnerability index.*

In the OECD's tracking progress system, seven out of 20 core indicators are selected to group countries. They are: GNP per capita, child malnutrition, net enrollment in primary education, under-five mortality ratio, total fertility rate, and access to safe water, among which the last five are selected to show disparity of development progress among groups in "development pentagons" (OECD, 2000). The World Bank selects similar indicators in its World Development Indicators (WDI) as those in the UNDP's Human Development Report. The indicators included in Table 1.2 of WDI are taken from these and were selected to measure progress toward the development goals proposed by DAC (World Bank, 1998). These indicators are private consumption per capita, net primary enrollment ratio, infant mortality rate, under-five mortality ratio, and population access to safe water.

Looney (1989) used 26 pairs of structural and performance indicators to determine whether and how small states differ from their larger counterparts, with special reference to the Caribbean region. Armstrong *et al.* (1998) provided a cross-sectional regression analysis of per capita income differences and growth rate variation among 105 "micro-states" (state with

Table 3. *Indicators used for factor analysis*[a]

X1. Population (1998)
X2. GDP per capita growth rate (average growth rate of per capita GDP, 1990–98)
X3. Export dependency (exports of goods and services as percentage of GDP, 1997–98)[b]
X4. Import openness (imports of goods and services as percentage of GDP, 1997–98)[b]
X5. Share of service exports (service exports as percentage of total exports of goods and services, 1994–98)[b,c]
X6. External debt ratio (external debt as a percentage of GNP, 1997–98)
X7. Debt services ratio (debt services as a percentage of exports of goods and services, 1997–98)
X8. Output volatility (standard variation of per capita GDP 1980–92)
X9. Vulnerability to natural disasters (1970–96)
X10. ODA per capita (average official development aid per capita, 1997–98)
X11. FDI per capita (average foreign direct investment per capita, 1997–98)
X12. Export instability index (average export instability index, 1990–96)
X13. Export diversification index (1995)[b]
X14. Commodity export concentration (share of Major export commodities in total exports, 1995)[b]
X15. Industry's share of GDP (1996)[b]
X16. Agriculture's share of GDP (1996)[b]
X17. Proportion of tourism receipts of export earnings (1996)
X18. Percentage of tourism receipts of GDP (1998)[c]
X19. PPP adjusted GDP per capita (purchasing power parity US$, 1998)
X20. Life expectancy at birth (1998)
X21. Adult literacy rate (1998)
X22. Combined school enrollment (1998)
X23. Infant Mortality rate (1998)
X24. Under-five mortality rate (1998)
X25. Total fertility rate (1999)

Sources: UNCTAD (2000) (X1–X7); Atkins *et al.* (2000) (X8–X9); UNDP (2000) (X10, X11); Commonwealth Secretariat (1998) (X12–X17); WTO (2000) (X18); UNDP (2000) (X19–X24); WHO (2000) (X25) World Health Report annex.

[a] Data are available form the first author upon request (e-mail: mayliou@gcn.net.tw).

[b] Most countries.

[c] Calculated by the authors.

a population less than three million) in 1980s and 1990s. It focused attention on indicators such as GDP per capita, GNP per capita, and their rates of growth over time. Our study selects accessible indicators used in the composite vulnerability index, the UNDP's HDI, the OECD's "development pentagons," the World Bank's indicators for progress development, and other social indicators to characterize small states.

Accurate and comparable statistics for small states are very hard to collect. Because of data constraints, one may select as many variables as possible and reduce the number of countries included, or may include more countries and give up the variables that are not available for some countries. This paper selects as many variables as possible in order to serve our grouping purposes better and includes as many countries as possible. Following this principle, 25 socioeconomic indicators were selected, and 40 out of the 49 small states as defined in the previous section were included. Indicators representing the general level of development of an economy, the above-mentioned characteristics of small states, and data sources are summarized in Table 3.

The year in parenthesis after variables in Table 3 denotes the year of the data used; nevertheless, when a country has missing data for a specific year, data of the nearest year for that country is used. Since not every indicator represents the same base year, data used in this paper may not perfectly meet the consistency requirement that general studies use. Data constraint is the reason for using the data of different years for certain variables. But since there is little possibility that the economic and social structure of these developing countries will change significantly within the span of a few years, data of the previous years can still strongly represent the features of the subject countries when making comparison among countries.

Some important indicators that differentiate small states such as remoteness, social capital, political sovereignty, are also not included here due to data constraints. Remoteness is a key characteristic of both island and land-locked countries because of the accompanying high

transportation costs. The data used to reflect remoteness, including ratio of transport and fright costs to exports (Briguglio, 1995), are not available for all of the sample countries here.

The concept of social capital offers a way to bridge the measurement of social development and economic development. But, precise measures of social capital allowing analysis of within-country and cross-country variations in poverty reduction, government performance, ethnic conflict, and economic growth require more research (Woolcock & Narayan, 2000). The concept of political sovereignty, which is straightforward in the 1949 United Nations Charter, is not a simple binary variable; it is rather a discrete scale ranging from full sovereignty under the UN Charter to relative autonomy in regions of larger states (Schaffer, 1975). Nevertheless, Armstrong and Read (2000) used the UN's definition of sovereignty as a simple binary variable to distinguish between small sovereign states and other small territorial entities. Their empirical study showed that small dependent states possess additional advantages independently of other determinants of economic performance. But its use as a binary variable is not suitable for factor analysis (see Section 3). Because of these constraints, the above three indicators are not included in this study.

3. COMMON FACTORS FOR SOCIOECONOMIC INDICATORS

Cluster analysis, a well-known statistical method, can be used to subgroup small states based on their socioeconomic characteristics. Cluster analysis can be based on the squared Euclidean distances among clustering units obtained from the clustering variables. Since intercorrelated socioeconomic characteristics measuring the same underlying factor can lead to implicit weighting, Green, Frank, and Robinson (1967) suggested that factor analysis be used to extract uncorrelated underlying dimensions, serving as clustering variables. Principal component factor analysis is used to discover underlying factors for the 25 socioeconomic indicators. Highly correlated indicators can be grouped to form a single dimension. The resulting fewer dimensions can represent most of the information of the original 25 socioeconomic characteristics. The number of factors extracted is determined by the "root greater than one" criterion. The varimax rotation was used to achieve a simple structure. Common factors of the grouped socioeconomic indicators are then analyzed and labeled.

The correlation matrix for the socioeconomic indicators, used as the input of factor analysis, was first examined. Many pairs of indicators display a substantial degree of correlation, indicating the usefulness of factor analysis. The results of factor analysis showing rotated factor loadings are displayed in Table 4. The seven factors account for 76% of the total variance, and a satisfactory fit to the correlation matrix has been obtained (the elements of the residual matrix were small). Since factor loadings are correlation coefficients between indicators and common factors, and each indicator has a high loading on one factor and low loadings on the other factors, highly correlated indicators are easy to identify. The maximum factor loading for each indicator was shown in the table to facilitate the presentation of highly correlated indicators grouped. Each factor is then labeled according to the common characteristics of its corresponding indicators.

The indicators with high loadings on Factor 1 in Table 4 include export diversification index, agriculture's share of GDP, PPP adjusted GDP per capita, life expectancy at birth, adult literacy rate, combined school enrollment, infant mortality rate, under-five mortality rate, and total fertility rate. Most of these indicators are related to poor standards of living and therefore Factor 1 can be labeled "level of poverty." The indicators include those used to build the UNDP's HDI. The loadings show that per capita GDP, life expectancy at birth, adult literacy rate, and combined school enrollment are negatively related to poverty level, while total fertility rate, infant mortality rate, and under-five mortality rate are positively related. Among the remaining two indicators, diversification in export products and agriculture's share of GDP positively relate to the level of poverty, which reveals that diversification is disadvantageous to small states due to their inherent domestic resource constraints and the fact that agriculture is a negative force in their development. These findings are consistent with those of previous researches (e.g., Armstrong *et al*., 1998).

The indicators with high loadings on Factor 2 are population, ODA per capita, FDI per capita, export instability index, and industry's share of GDP. This factor is labeled "economic scale." Population and development of industry are positively related to the scale of small states,

Table 4. *Principal component factor analysis for 25 socioeconomic indicators*

Indicator	Varimax rotated factor loadings						
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
Population		0.690					
GDP per capita growth rate						−0.721	
Export dependency				0.658			
Import openness				0.823			
Share of service exports			0.734				
External debt ratio					0.851		
Debt services ratio					0.767		
Output volatility				0.665			
Vulnerability to natural disasters						0.749	
ODA per capita		−0.722					
FDI per capita		0.571					
Export instability index		−0.604					
Export diversification index	0.632						
Share of major export commodities							0.842
Industry's share of GDP		0.755					
Agriculture's share of GDP	0.651						
Proportion of tourism receipts of export earnings			0.817				
Percentage of tourist receipts of GDP			0.889				
PPP adjusted GDP per capita	−0.713						
Life expectancy at birth	−0.825						
Adult literacy rate	−0.644						
Combined school enrollment	−0.673						
Infant mortality rate	0.914						
Under-five mortality rate	0.900						
Total fertility rate	0.815						

Factor 1: level of poverty. Factor 2: economic scale. Factor 3: tourism development. Factor 4: vulnerability to international markets. Factor 5: external indebtedness. Factor 6: vulnerability to natural disasters. Factor 7: commodity export concentration.

which also encourages foreign direct investment. Per capita ODA as well as export instability are smaller in large countries than in small states (Collier & Dollar, 1999).

The indicators with high loadings on Factor 3 include proportion of tourist receipts of total export earnings, percentage of tourist receipts of GDP, and share of service export. This factor can be labeled "tourism development."

The indicators with high loadings on Factor 4 are output volatility, export dependence and import openness. This factor is labeled "vulnerable to international markets." The more open an economy is the more output volatility it has, which reflects the small states' vulnerability to fluctuation of international markets (Easterly & Kraay, 1999).

Factor 5 is associated with average external debt ratio and average debt service ratio, and is accordingly labeled "external indebtedness."

The indicators with high loadings on Factor 6 are vulnerability to natural disasters and average GDP per capita growth rate. The factor can be called "vulnerability to natural disaster." The negative relation between these two indicators shows that the more vulnerable to natural disasters a country is, the lower growth it has.

Factor 7 contains a single indicator, share of major export commodities in merchandise exports, and is thus labeled "commodity export concentration."

4. SUBGROUPING SMALL STATES

The seven common factors extracted from factor analysis are further used as clustering variables, along with factor-based scores, to partition the heterogeneous small states into

several internally homogeneous groups. The indicators associated with each factor were first standardized to eliminate unit inconsistency; the averages of their values were then computed to form the factor-based scores. Indicators with negative loadings were reversed before averaging. Hierarchical clustering was used because the number of clustering units (40 small states) is small. Since the average linkage method (based on the Euclidean distance) and Ward's minimum-variance method outperform other hierarchical clustering methods (e.g., Pung & Stewart, 1983), they will be used to cross-check for the robustness of the dendrogram results. The dendrograms obtained from the two clustering methods were displayed, respectively in Figures 2 and 3. Examining the relative distances among the states in both sets of figures, we may divide them into three, four or nine subgroups. If, say, the four-cluster solution were adopted, the number of countries in each cluster would be 2, 23, 14, and 1 (the average linkage method) or 2, 11, 12, and 15 (Ward's method). The inconsistent resulting clusters between the two methods showed its failure to meet the requirement of robustness. For this reason, the nine-cluster solution was selected. The squared distances among states within each of the nine subgroups are relatively smaller than those among subgroups. Clustering results from the two methods were shown in Table 5. The different parts were highlighted in the table. It appears that the two methods have produced rather consistent results with the exception that five countries (Fiji, Jamaica, Trinidad & Tobago, Swaziland, and Maldives) are grouped differently in these two clustering method. This dissimilarity will be taken into account later in the interpretation of the characteristics of the different clusters obtained.

For each cluster, the average score of the small states for all factors were calculated. The larger the average score, the larger magnitude of the characteristic it represents. The scores with absolute values greater than or close to one for each cluster were reported so as to show the magnitude of the characteristics of each cluster and each cluster can then be labeled accordingly (Table 6). Although the characteristics of clusters 1–3 are not very remarkable, the absolute value of scores close to one and inherent features can still be identified.

According to the average linkage method, cluster 1 comprises 11 small island states, half of which are located in Latin America and the Caribbean region, three in the Pacific, and one each in the Mediterranean and Africa. The highest score in Cluster 1 is "commodity export concentration," with a negative sign. This cluster is labeled "export-diversified group" to reflect moderately diversified commodity exports. Many countries in this group have been suffering from decreasing world prices and phasing out of import preference regimes for traditional single products (mostly bananas and sugarcane). But, many of these countries have successfully diversified their economy into tourism and light industries. These countries include most Caribbean countries, such as the Barbados, Dominica, Grenada, St. Kitts & Nevis, St. Lucia and St. Vincent & Grenadines, among which St. Lucia is the most diversified economy in the East Caribbean region. The Pacific island countries of Samoa, Kiribati, and Fiji are still agriculture-based economies exporting agricultural or agro-processing products. Cyprus, the only European country in this group, has developed diversified industries including foods, beverages, textiles, chemicals, wood products, metal products and tourism. The Maldives were included in this cluster if Ward's method is used and Fiji would be characterized more on its vulnerability to natural disasters (see cluster 7). The Ward's method does not change the magnitude of commodity concentration of this cluster but highlights the tourism-based feature of this cluster.

Cluster 2 consists of 14 countries (using the average linkage method) spreading over different regions. This group, contrary to cluster 1, is characterized by positive "commodity export concentration" and is labeled "export-concentrated group." In this group, Bahrain, Brunei and Qatar are rich in petroleum and natural gas and are the most developed countries among developing small states; Botswana, Cape Verde, and Namibia are dependent on mining deposits such as diamond and nonfuel mining; Jamaica and Trinidad & Tobago have key sectors of bauxite and petrochemical; Belize and Solomon Islands are based primarily on sugarcane and agro-based industries or the forestry sector. Malta is dependent on foreign trade, manufacturing (especially electronics and textiles), and tourism. Mauritius has successfully diversified away from sugarcane in the 1970s and now has a relatively well-diversified economy with growing industrial, financial, and tourist sectors. But, sugarcane is grown on about 90% of its cultivated land area and still accounts for 25% of export earnings while the UK market

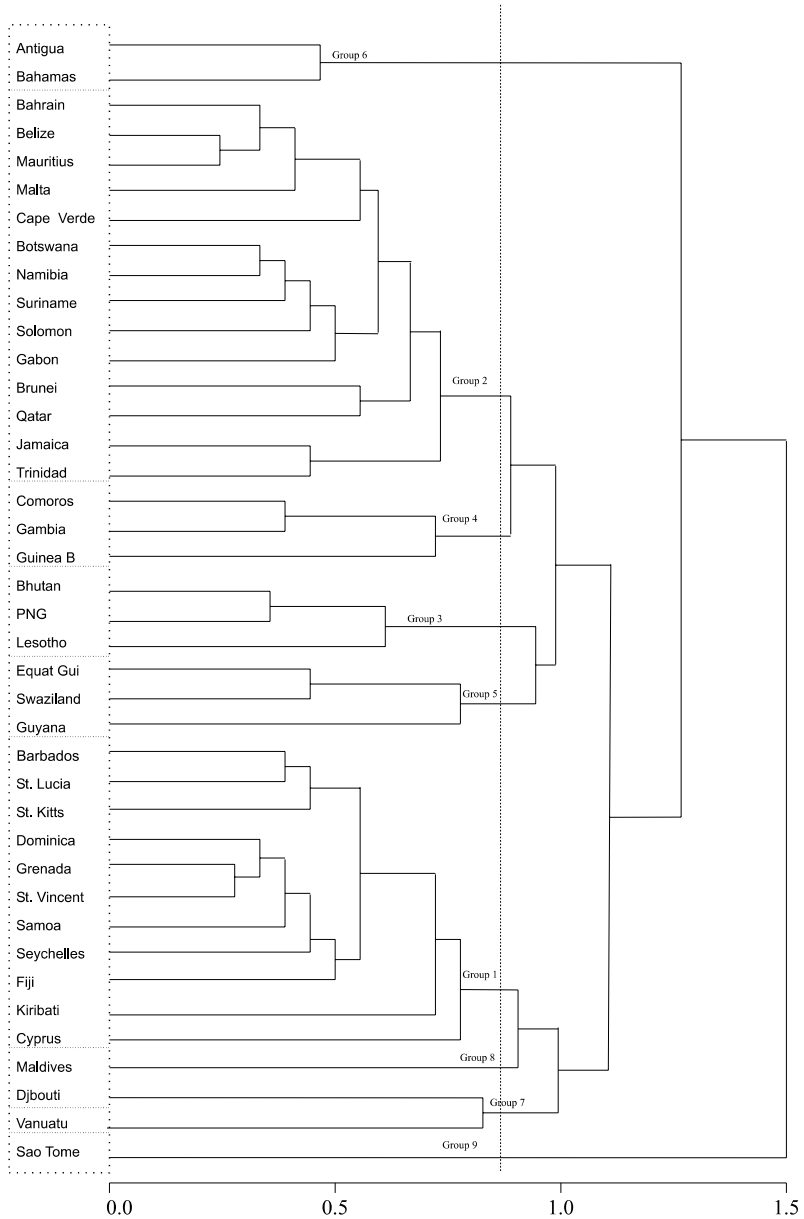

Figure 2. *Dendrogram from cluster analysis using the average linkage method.*

accounts for 32% of Malta's total exports (CIA, various years). Jamaica and Trinidad & Tobago are excluded from this cluster if Ward's method is used. But, this does not change the magnitude of the characteristics of this cluster.

Cluster 3 is characterized by poverty and diversified commodity exports and is labeled "poor export-diversified group." Lesotho, Papua New Guinea, and Bhutan in this group are all agriculture-based and suffer from mountainous rugged terrain, which leads to high infrastructure costs for them. The common characteristic of Lesotho and Bhutan is their land-locked geography, which leads to a high

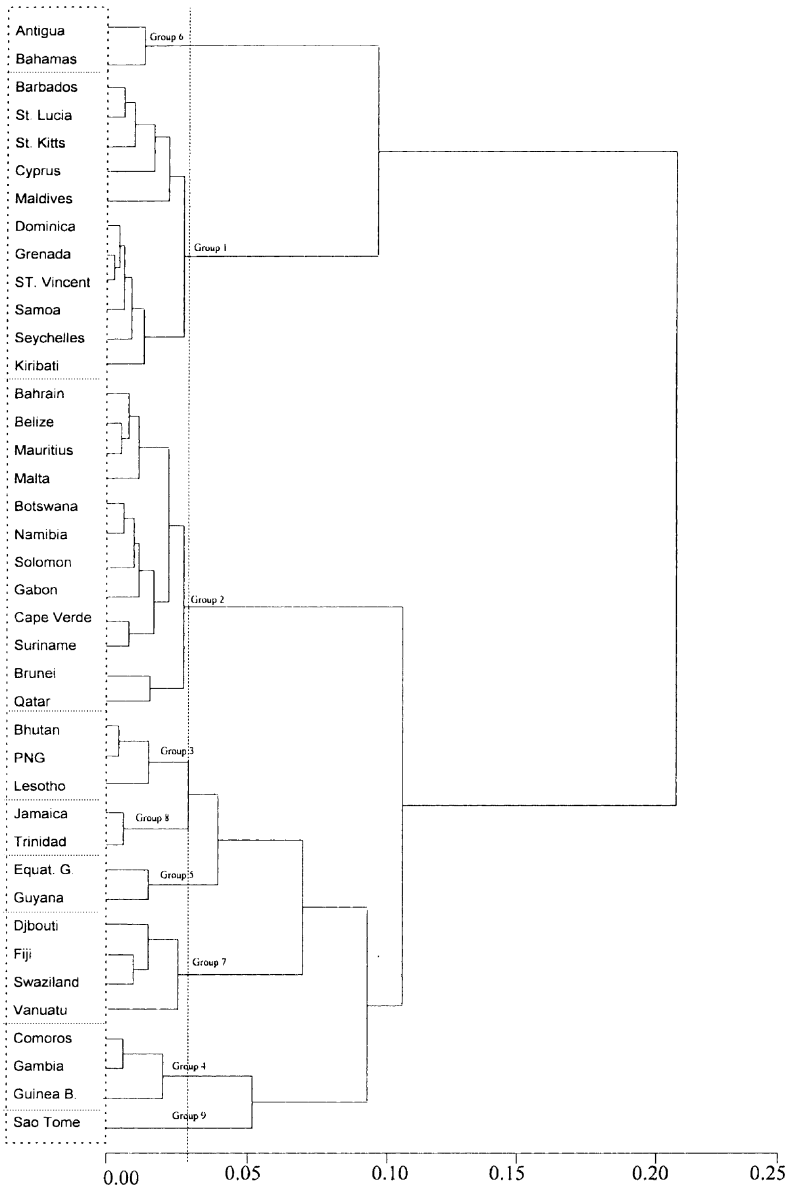

Figure 3. *Dendrogram from cluster analysis using Ward's method.*

degree of reliance/dependence on neighboring states for surface communications and port facilities, and therefore for access to export markets and import sources.

Cluster 4 is simply characterized by poverty and thus is labeled "least developed group." This group consists of three LLDCs, the Comoros, Gambia, and Guinea Bissau.

Cluster 5 is characterized by vulnerability to international markets and is labeled "vulnerable to international markets group." Equatorial Guinea, Guyana and Swaziland (average linkage method) are agriculture-based economies with manufacturing features in a number of agro-processing industries; however, Equatorial Guinea has been changing since 1996 when

Table 5. *Subgroups resulting from cluster analysis*[a]

Region	Africa	Middle East & North Africa	Latin America & Caribbean	East Asia & Pacific Region	South Asia	Mediterranean Region
Cluster 1	Seychelles		Barbados Dominica Grenada St. Lucia St. Kitts & Nevis St. Vincent & Grenadines	*Fiji* Kiribati Samoa **Maldives**		Cyprus
Cluster 2	Botswana Cape Verde Gabon Mauritius Namibia	Brunei Bahrain	Belize Suriname *Jamaica* *Trinidad & Tobago*	Solomon Islands		Malta Qatar
Cluster 3	Lesotho			Papua New Guinea	Bhutan	
Cluster 4	Comoros Gambia Guinea Bissau					
Cluster 5	Equatorial Guinea *Swaziland*		Guyana			
Cluster 6			Antigua & Barbuda Bahamas			
Cluster 7	**Swaziland**	Djibouti		Vanuatu **Fiji**		
Cluster 8			**Jamaica** **Trinidad & Tobago**	*Maldives*		
Cluster 9	São Tomé & Principe					

Cluster 1: export-diversified group. Cluster 2: export-concentrated group. Cluster 3: poor export-diversified group. Cluster 4: least developed group. Cluster 5: vulnerable to international market group. Cluster 6: vulnerable tourism-based concentrated group. Cluster 7: vulnerable to natural disaster group. Cluster 8: tourism-based diversified group. Cluster 9: highly indebted group.

[a] Bold: clustered using Ward's method; italics: clustered using the average linkage method.

natural gas was discovered and exploited. Countries in this cluster have high volatility on income growth and a great share of export–import value on their GNP. Swaziland is excluded from this cluster if the Ward's method is used. But, the magnitude factor of this cluster remains the same. This cluster is different from cluster 2 for the latter is characterized by export concentration while the former is characterized by an open economy in exports as well as imports and is more volatile in income growth.

Three factors including tourism development, vulnerability to natural disasters, and commodity export concentration characterize cluster 6. Two Caribbean island states fit in this group, Antigua and Barbuda and the Bahamas, both of which have tourism industries producing more than 80% of their GDP. Hurricanes and other tropical storms frequently cause extensive flood and damage to them, so this cluster is called "vulnerable tourism-based concentrated group."

Cluster 7 is characterized by vulnerability to natural disasters and is labeled "vulnerable to natural disaster group." Djibouti, an economy based on service activities located in North

Table 6. *The scores with larger magnitude for each cluster*[a]

	Factor 1: level of poverty	Factor 2: economic scale	Factor 3: tourism development	Factor 4: vulnerable to international markets	Factor 5: external indebtedness	Factor 6: vulnerable to natural disasters	Factor 7: commodity export concentration
Cluster 1							*−0.844*
			0.934				**−0.942**
Cluster 2							*0.830*
							−0.984
Cluster 3	0.944						−0.964
Cluster 4	1.318						
Cluster 5				*1.492*			
				1.700			
Cluster 6			1.953			1.138	1.339
Cluster 7						*1.974*	
						1.363	
Cluster 8			*2.488*				*−1.663*
				1.642			
Cluster 9					3.880		

Cluster 1: export-diversified group. Cluster 2: export-concentrated group. Cluster 3: poor export-diversified group. Cluster 4: least developed group. Cluster 5: vulnerable to international market group. Cluster 6: vulnerable tourism-based concentrated group. Cluster 7: vulnerable to natural disaster group. Cluster 8: tourism-based diversified group. Cluster 9: highly indebted group.

[a] Bold: average scores for clusters from Ward's method; italics: average scores for clusters from the average linkage method.

Africa, and Vanuatu, an economy based primarily on small-scale agriculture in the Pacific, are included in this group (average linkage method). Earthquakes, droughts, occasional cyclonic disturbances threaten these two small economies. Swaziland and Fiji are clustered in this group if the Ward's method is used, which draws more attention to their vulnerability to natural disasters.

Cluster 8 is characterized by tourism development and low commodity export concentration. This cluster is labeled "tourism-based diversified group," and the Maldives is the only country in that subgroup (average linkage method) and is designated as a LDC by the UN. Jamaica and Trinidad & Tobago form a single cluster and is characterized by countries vulnerable to international markets if Ward's method is used (Maldives is clustered into cluster 1). In either clustering method, these two countries are characterized by their active trade sector, which reflect their well-diversified manufacturing economy. This cluster is very similar to cluster 4 as both of them are vulnerable to international market fluctuations, though the former is more advanced than the latter.

Cluster 9 is characterized by high indebtedness and is labeled "highly indebted group." São Tomé & Principe, which is the only country in this group, is qualified as a HIPC by the UN.

5. DISCUSSIONS AND MANAGERIAL IMPLICATIONS

The results of factor analysis in Section 2 show that small states can be characterized by seven common factors: level of poverty, economic scale, tourism development, vulnerability to international markets, external indebtedness, vulnerability to natural disasters, and commodity export concentration. The results confirm most of the characteristics of small states identified by previous studies (e.g., Armstrong *et al.*, 1998; Briguglio, 1995; Commonwealth Advisory Group, 1997) except that remoteness is not included here due to data

constraints. That vulnerability to international markets and natural disasters have been identified as important factors for small states also supports the international development community's intention to include degrees of vulnerability into the criteria used to identify "least developed countries" in the provision of international aid. Since the clusters obtained by using the average linkage and the Ward's methods are not very different, clusters obtained from the average linkage method are mainly used in the following discussion.

Economic scale was identified as one of the underlying factors of development of small states in the factor analysis, but none of the nine groups clustered here is markedly characterized by it (see Table 6); this reveals that economic scale does not affect the grouping of similar countries. In addition, countries clustered into each of the first three clusters spread over different regions, which shows that small states can be more similar to other small states in other regions than to some in their own region in terms of the selected socioeconomic characteristics. This result is different from previous findings that showed that even though small states generally have a very diverse set of characteristics in the regions they are located, much of the variation among micro-states at a world level can be accounted for by variations between the broad regions of which they are constituent members (Armstrong *et al*., 1998). This discrepancy is not surprising as previous research made comparison merely based on small states economic performances (represented by GDP per capita) while this study is based on broader socioeconomic indicators. In the provision of international aid, multilateral agencies emphasize the allocation and implementation of development aid on a regional basis wherever possible (e.g., in the Caribbean and the Pacific). Attention could also be directed toward the specific dimensions of each group identified in this study in order to more effectively and economically manage the development of small states. For regions in which countries present differences in socioeconomic characteristics, attention could indeed be given to these differences among countries when formulating regional strategies. Different tactics and priorities of resource allocation may be offered differentially from one country to another even if they are in the same region. Furthermore, assistance strategies formulated for a group are applicable to all countries in the group even if one (or more) is located in a different region. For instance, Guyana is more similar to the "vulnerable to international market group" and is different from other Caribbean countries. Another example is Djibouti, which is more vulnerable to natural disasters than other African small states.

Multilateral agencies have identified four priority areas for their action plans to assist small states in tackling development challenges. These areas are tackling volatility vulnerability and natural disasters, strengthening capacity, addressing issues of transition to the changing global trade regime, and addressing key challenges and exploiting new opportunities arising from globalization (Advisory Board to the Joint Commonwealth Secretariat/World Bank Task Force, 1999). These areas are to be applied to all small states. Priority may be determined differentially, however, from cluster to cluster according to their specific characteristics and needs.

The "export-diversified group" has been successful in economic diversification to manufacturing and tourism, but many countries in this group suffer from tourist fluctuation, which lead to more vulnerability than for the "export-concentrated group." The "export-concentrated group" is dependent on a few mining, agricultural, fishery, or forestry products. Transition to the changing global trade regime and exploiting new opportunities arising from globalization will be the most important issues for both "export-diversified" and "export-concentrated" groups. The phasing out of preferential trade agreements and not being marginalized by the World Trade Organization (WTO) and the global trade regime shift are priority concerns for these two groups. For example, multilateral agencies may want to foster easier access to markets in developed countries for these small states, as they would not be much of a threat anyway because of their small production. Their entry into the WTO may mean that this will not be necessary, but still, these countries need a fast track entry to their main markets without quid pro quo.

Assisting vulnerable states to recover from external shocks should be the highest priority addressed for the "vulnerable to natural disaster group," the "vulnerable to international market group," and the "vulnerable tourism-based diversified group." The development of some form of safety nets could ensure that

these small states can recover faster from any external shocks, be they economic or natural disasters. Rehabilitation measures for infrastructure, for example, must be constantly upgraded and be implemented as quickly as possible after a natural disaster. Approval for such measures by multilateral agencies may follow umbrella or routine procedures that can be effective quickly. This is of utmost important to the ''vulnerable to natural disaster group.''

For the poverty-featured groups such as the ''highly indebted group,'' the ''poor export-diversified group,'' the ''least developed group,'' and the ''tourism-based diversified group,'' risk management is vitally important. Risk analysis used by international organizations for funding projects in small countries should be stringently done. As the risks are clearly known, provisions for risk reduction should also be made upfront. Furthermore, the smallness of these small economies does not allow for too many mistakes in servicing loan charges; greater coordination among multilateral and bilateral agencies is needed to ensure that these small countries are not heavily indebted.

6. CONCLUSIONS

Any small state may be vulnerable due to multiple handicaps and external shocks. Nevertheless, international aid should be allocated according to priority setting based on the development characteristics of a country. The international organizations normally form assistance strategies for a country on a regional basis. It may be more effective, however, to shape strategies for small states by grouping these countries across regions based on their respective socioeconomic characteristics. Rather than using single indices, as is the common usage in the development community, this study has successfully characterized small states using seven common factors extracted from 25 socioeconomic indicators, and further refined their subgrouping by using cluster analysis to divide these small states into nine mutually heterogeneous but internally homogeneous groups. This allows for better investigation of their specific features, and thus improved organization of the provision of aid. The results of factor analysis have confirmed the features of small states related to smallness, poverty, indebtedness, tourism development, vulnerability to natural and economic shocks, and export concentration. In the cluster analysis results, characteristics of each of the nine groups have been identified. Those countries that have similar socioeconomic characteristics may share similar development strategies even if they are located in different regions. Priorities for the provision and allocation of international aid can be addressed for each of the nine groups according to these identified characteristics. In the provision of international aid, more emphasis is needed on the export-oriented groups (''export-diversified group'' and ''export-concentrated group''), while building safety nets will be essential in the provision of international assistance to vulnerable groups (''vulnerable to natural disaster group,'' ''vulnerable to international market group,'' and ''vulnerable tourism-based concentrated group''). More weight should be put on risk management for the poverty-featured groups (''highly indebted group,'' ''poor export-diversified group,'' ''least developed group,'' and ''tourism-based diversified group'').

The findings of this study provide new directions to the international development community in effectively and efficiently allocating resources. They also provide a base for more in-depth work aiming at developing assistance strategies for different groups of small states.

NOTES

1. Groups under major world classifications are OECD countries, all developing countries, and Eastern Europe and the CIS. Developing countries are further classified by nine regions: Arab States, East Asia, Latin American and the Caribbean (including Mexico), South Asia, South-East Asia and the Pacific, Southern Europe and Sub-Saharan Africa. An additional classification is the least developed countries defined by the United Nations. In terms of human development classifications, all countries are classified into three clusters by achievements in human development, i.e. high, medium and low. In terms of income classifications, all countries are grouped by income based on World Bank classifications: high income (GNP per capita of $9,361 or more in 1998), middle income ($761–9,360), and low income ($760 or less).

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APPENDIX A. SOURCES AND DEFINITION OF DATA

Data used in this study were collected directly or calculated by the authors using data collected from data sources of different disciplines and periods. This may trigger some data inconsistency. In addition, some data collected directly from other researches (such as output volatility, export instability index, export diversification index etc.) lead to time lag problems. More recent data would reflect the current situation of small states more properly.

Data	Period	Definition	Source
Population (X1)	1998		Collected from UNCTAD (2000, Table 6.1)
GDP per capita growth rate (X2)	1990–98	Average of growth rate of per capita GDP	Collected from UNCTAD (2000, Table 6.2)
Export dependency (X3)	1997–98	Average of expenditure of exports of goods and services on GDP	Calculated by the authors using data collected from UNCTAD (2000, Table 6.3)
Import openness (X4)	1997–98	Average of expenditure of imports of goods and services on GDP	Calculated by the authors using data collected from UNCTAD (2000, Table 6.3)
Share of service exports (X5)	1994–98	Average of service exports as percentage of total exports of goods and services	Calculated by the authors using data collected from UNCTAD (2000, Table 5.1)
External debt ratio (X6)	1997–98	Average of external debt as a percentage of GNP	Calculated by the authors using data collected from UNCTAD (2000, Table 5.7)
Debt service ratio (X7)	1997–98	Average of external debt services as a percentage of exports of goods and services	Calculated by the authors using data collected from UNCTAD (2000, Table 5.7)

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Data	Period	Definition	Source
Output volatility (X8)	1980–92	Standard deviation of annual rates of growth of constant price GDP per capita	Collected from Atkins *et al.* (2000, Table 2)
Vulnerability to natural disasters (X9)	1970–96	Frequency of natural disasters relative to land area	Collected from Atkins *et al.* (2000, Table A3.1)
ODA per capita (X10)	1998		Collected from UNDP (2000, Table 18)
FDI per capita (X11)	1998		Collected from UNDP (2000, Table 15)
Export instability index (X12)	1990–96		Collected from Commonwealth Secretariat (1998, Table 19)
Export diversification index (X13)	1995		Collected from Commonwealth Secretariat (1998, Table 18)
Commodity export concentration (X14)	1995	Average of share of major export commodities in total exports	Collected from Commonwealth Secretariat (1998, Table 17)
Industry's share of GDP (X15); Agriculture's share of GDP (X16)	1996		Collected from Commonwealth Secretariat (1998, Table 5)
Proportion of tourism receipts of export earnings (X17)	1996		Collected from Commonwealth Secretariat (1998, Table 26)
Percentage of tourism receipts of GDP (X18)	1998	International tourism receipts as a percentage of total GDP	Calculated by the authors using data collected from WTO (2000) for international tourism receipts and UNCTAD (2000) for total GDP
PPP adjusted GDP per capita (X19); Life expectancy index (X20); Adult literacy rate (X21); Combined school enrollment (X22)	1998	Purchasing power parity US$	UNDP (2000, Table 1)
Infant mortality rate (X23); Under-five mortality rate (X24)	1998		UNDP (2000, Table 9)
Total fertility rate (X25)	1999		WHO (2000, Annex Table 2)