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by

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Abstract

The paper studies the commutative and causality relationship between economic openness and indigenous factors for 122 world economies by using the constructed Openness Index and Indigenous Index. The empirical findings show that there is a positive and significant static effect of openness on indigenous factors and vice versa, though the latter is larger. There are also bi-directional causality relationships between openness and indigenous factors. Indigenous factors help to forecast openness factors and vice versa.

JEL Classifications: C33, F02, O11.

Keywords: Openness, indigeneity, panel data model, commutative effect, causality.

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1. Introduction

While inter-dependence among economies is the ultimate objective in globalization (UNCTAD 2004), the major economic debates on globalization can be condensed into the discussion on the two types of factors: openness factors and indigenous factors. Openness often refers to such external factors of trade, capital flows and foreign direct investment. For example, Frankel and Romer (1999) have shown that trade has a positive effect on income growth, while Feldstein (2000) has identified the five aspects of globalization to include the gains from international flows of goods and capital, the increase in foreign direct investment, the occurrence of currency crises, the fluctuation of relative currency values and the segmentation of global capital market.

Other studies on globalization have brought up the relevance of such internal or indigenous factors as the rule of law, political stability, education attainment and so on in their impact on growth and globalization. For example, Li and Reuveny (2003) have provided an empirical study on economic globalization and democracy, Mah (2002) has examined the impact of globalization on income distribution in Korea, Heinemann (2000) has studied whether or not globalization restricts budgetary autonomy, while Dollar and Kraay (2003) have emphasized the importance of institutions and study the empirical relationship between some proxies of institutions and trade.

Recent studies on globalization tend to use a mixure of openness and indigenous factors in constructing an index to rank different economies (Kearney 2002; Lockwood 2004; Anderson and Herbertsson 2005; Dreher 2006; Heshmati 2006 and Li *et al*. 2007). One advantage in constructing a globalization index is that it can be used for empirical study with a parsimonious regression model in which the multi-linearity or omitted variables problems can effectively be avoided. Such empirical studies can also be used in comparative analysis on the different performance of globalization among economies.

This paper distinguishes indigenous factors from the openness factors and studies their relationship. While openness factors do have a direct impact on globalization and economic growth, indigenous factors can have both a direct impact on globalization and economic growth and an indirect impact through improvement in the performance of openness factors. Conceptually, the dichotomy in the performance

of these two groups of factors can be seen as complementary with rather than conflicting to each other. Ng and Yeats (1998), for example, have shown that economies that are more outward oriented in trade and governance policies generally achieved a higher level of GDP per capita. Wei (2003) has looked at Asia's globalization experience, and found that the risk and reward for an economy to embrace globalization depends in part on the quality of its public governance. The importance of good governance has also been studied by Basu (2003), Brusis (2003) and World Bank (2005).

Instead of looking at some sub-dimensions in both the openness and indigenous factors, we are more interested to examine the overall effects between these two groups of factors. Due to the same reasons in the other studies on the construction of the globalization index (Kearney 2002; Lockwood 2004; Anderson and Herbertsson 2005; Dreher 2006; Heshmati 2006 and Li *et al*. 2007), both the indigenous factors and the openness factors are generalized into two indices for our empirical study.

We construct two composite indices for 13 openness factors and 14 indigenous factors to provide an overall measurement among 122 world economies for the period of eight years (1998-2005). The definition of factors and the data source are given in the Appendix. Our method avoids the emergence of possible negative weights in the individual indicators which can occur when the construction of the index is conducted by using the principal component analysis (Rencher 2002). Hence each of the positive weights less than one reflects the contribution of each of the sub-dimensions in the component to the index. Certainly, with the available data, the two indices have

covered the most important aspects of globalization and “indigeneity” in an economy.

To study the relationship between openness and indigeneity, we first specify static panel data models and estimate their commutative effect. Then we turn to the dynamic panel data model to test their Granger causality using a recent approach in Hurlin and Venet (2001) and Hurlin (2007). Our empirical study shows that although there is a positive and significant effect of openness on indigeneity and vice versa, the effect of the latter is larger. There is a bi-directional causality relationship between openness and indigeneity. Indigeneity helps to forecast openness and at the same time openness helps to forecast indigeneity.

The remainder of this paper is organized as follows. Section 2 elaborates on the methodology to construct the openness index and the indigenous index and presents rankings of the two indices for the world economies in our sample. A comparitive analysis is also presented. Section 3 specifies the static panel data models to estimate the commutative effects of openness and indigeneity. Section 4 conducts the Granger causality test by specifying a dynamic panel data model. Section 5 concludes the paper.

2. The Constuction of the Two Indices

It is generally known that there exists no uniformly agreed methodology to weight individual indicators before aggregating them into a composite index. Compared with the average or other subjective weighting methods, different weights may objectively be assigned to component series in order to reflect their different

economic significance. Weights usually have an important impact on the composite index value and on the resulting ranking especially when higher weight is assigned to indicators that can perform significantly in some economies. In short, the weighting models have to be made explicit and transparent before they are used to construct a composite index.

One commonly used method for weighting the indicators for the construction of a globalization index is the principal component analysis (PCA) (Lockwood 2004; Andersen and Herbertsson 2005; Dreher 2006; Heshmati 2006; Li *et al*. 2007). However, the PCA methodology does not always provide individual indicators in the model with positive weights (Lockwood 2004, p.516). Although Andersen and Herbertsson (2005) have used the multivariate technique of factor analysis to perform a globalization ranking for the 23 OECD countries, they do not present the weights of the factors and the specific indices for the countries.

In the construction of the Openness Index, we follow Kearney (2004) to group the openness factors into four categories of Economic Integration, Technology Connectivity, Personal Contact, and International Engagement; though the factors in each category are slightly modified due to data differences (Lockwood 2004; Dreher 2006; and Heshmati 2006). However, we include Economic Freedom as an additional category in the list of openness factors as freedom of an economy can greatly affect the extent of globalization. In constructing the Indigenous Index, we follow Li *et al*. (2007) in grouping the factors into the two categories of Institutional Establishment, and Education and Health. However, we also include Inflation as an additional

indigenous factor as it can provide a good summary indicator on economic indigeneity. The various categories of openness and indigeneous factors are shown in Table 1.

To constructing the two indices, we first transform each variable in the two indicators to a unit-free index (Lockwood 2004; and Dreher 2006). Since we use panel data, the transformation is conducted on an annual basis. We denote the original variable as z_{it}. Then the transformed index is

$$Z_{it} = \begin{cases} \dfrac{z_{it} - \min_t z_{it}}{\max_t z_{it} - \min_t z_{it}}, & \text{if higher } z_{it} \text{ indicates higher openness (indigeneity),} \\ \dfrac{\max_t z_{it} - z_{it}}{\max_t z_{it} - \min_t z_{it}}, & \text{if higher } z_{it} \text{ indicates less openness (indigeneity).} \end{cases}$$

The multiple factor analysis is then applied to the transformed indices in order to construct the two indices (Rencher 2002; Andersen and Herbertsson 2005). The construction method used for the Indigenous Index can easily be generalized to the construction of the Openness Index. Denote the three categories of indigenous factors in Table 1 as y_1, y_2 and y_3. There are a total of nine, four and one components in the y_1, y_2 and y_3 categories, denoted as x_1, …, x_9, x_{10}, …, x_{13}, and x_{14}, respectively.

Suppose there are p variables x_1, …, x_p that are used as factors in the construction of the index and m underlying common factors $f_1, \cdots, f_m$, which are orthogonal to each other. The basic model is

$$\begin{aligned} x_1 - \mu_1 &= \alpha_{11} f_1 + \alpha_{12} f_2 + \cdots + \alpha_{1m} f_m + \varepsilon_1 \\ x_2 - \mu_2 &= \alpha_{21} f_1 + \alpha_{22} f_2 + \cdots + \alpha_{2m} f_m + \varepsilon_2 \\ &\vdots \\ x_p - \mu_p &= \alpha_{p1} f_1 + \alpha_{p2} f_2 + \cdots + \alpha_{pm} f_m + \varepsilon_p \end{aligned}$$

Table 1 Openness Index and Indigenous Index: Factors and Categories

Openness Factors	Indigenous Factors
I. Economic Integration: (y_1, b_1)	I. Institutional Establishment: (y_1, b_1)
1) Total trade flow (% GDP): (x_1, a_1; w_1)	1) Corruption Perception Index: (x_1, a_1; w_1)
2) Foreign direct investment (% GDP): (x_2, a_2; w_2)	2) Voice and accountability: (x_2, a_2; w_2)
3) Gross private capital flow (% GDP): (x_3, a_3; w_3)	3) Political stability: (x_3, a_3; w_3)
4) Restrictions: Average applied tariff rates (unweighted in %): (x_4, a_4; w_4)	4) Government effectiveness: (x_4, a_4; w_4)
II. Economic Freedom: (y_2, b_2)	5) Regulatory quality: (x_5, a_5; w_5)
5) Trade freedom (%): (x_5, a_5; w_5)	6) Rule of law: (x_6, a_6; w_6)
6) Financial freedom (%): (x_6, a_6; w_6)	7) Control of corruption: (x_7, a_7; w_7)
7) Investment freedom (%): (x_7, a_7; w_7)	8) Property rights protection: (x_8, a_8; w_8)
III. Technology Connectivity: (y_3, b_3)	9) Regulatory scores: (x_9, a_9; w_9)
8) Internet users: (x_8, a_8; w_8)	II. Education and Health: (y_2, b_2)
IV. Personal Contact: (y_4, b_4)	10) Primary school enrollment rate: (x_{10}, a_{10}; w_1)
9) International tourism (% population): (x_9, a_9; w_9)	11) Public spending on education: (x_{11}, a_{11}; w_{11})
10) International voice traffic: (x_{10}, a_{10}; w_{10})	12) Primary school pupil-teacher ratio: (x_{12}, a_{12}; w_{12})
V. International Engagement: (y_5, b_5)	13) Total health expenditure: (x_{13}, a_{13}; w_{13})
11) Membership of international organizations: (x_{11}, a_{11}; w_{11})	III. Inflation: (y_3, b_3)
12) Government transfer (% GDP): (x_{12}, a_{12}; w_{12})	14) Growth rate of implicit GDP deflator (annual %): (x_{14}, a_{14}; w_{14})
13) Troop contribution (% of total): (x_{13}, a_{13}; w_{13})	

Note: See Appendix Table for definitions and sources of data.

Each error term accounts for the part of the variable that is not common with the other variables, the coefficients α_{ij} are factor loadings, showing how each x_i individually depends on the common factors $f_1, \cdots, f_m$. The assumptions we use include (see Rencher 2002, Chapter 13)

$$E(f_j) = 0, Var(f_j) = 1, \text{cov}(f_j, f_k) = 0,\ j \neq k;$$
$$E(\varepsilon_i) = 0, Var(\varepsilon_i) = \psi_i, \text{cov}(\varepsilon_i, \varepsilon_j) = 0, i \neq j; \text{ and}$$
$$\text{cov}(\varepsilon_i, f_j) = 0.$$

Armed with these assumptions, the first *m* principal components (*m* to be determined) are the good candidates for the common factors. So we choose $f_1, \cdots, f_m$ as the first *m* principal components of the correlation matrix of the *p* variables $x_1, \ldots, x_p$. Without a

loss of generality, we use standardized variables x_1, ……, x_p. Therefore, we have $\alpha_{ij} = corr(x_i, f_j)$. The variance of x_i can be partitioned into a component due to the common factors, that is

$$\sigma_{ii} = Var(x_i) = \left(\alpha_{i1}^2 + \alpha_{i2}^2 + \cdots + \alpha_{im}^2\right) + \psi_i \equiv h_i^2 + \psi_i ,$$

where

Communality = $h_i^2 = \alpha_{i1}^2 + \alpha_{i2}^2 + \cdots + \alpha_{im}^2$, and

Specific variance = ψ_i.

The former is also called the common variance. The factor loadings (the correlation between x_i and the principal components) $(\alpha_{i1}, \alpha_{i2}, \cdots, \alpha_{im})$ and the communality h_i^2 reflect the contribution of x_i to the principal components. The larger the communality h_i^2 is, the higher the contribution of the communality to the variance of x_i, and more information about x_i is reflected. Therefore, the communality can be used as a gist to determine the weight for each of the individual factors. The weights of x_1, …, x_p are defined as

$$w_i = h_i^2 / \sum_{i=1}^{p} h_i^2, \quad i = 1, \cdots, p ,$$

with $0 < w_i < 1$ and $\sum_{i=1}^{p} w_i^2 = 1$.

In constructing the Indigenous Index, the weights are determined by using the following steps. All the weights that correspond with the indicators are shown in Table 1.

Step 1: We conduct the PCA on the sample correlation matrix R of the sample of the variables $x_1, x_2, \cdots, x_{14}$ and select the first *m* principal components $f_1, \cdots, f_m$ with the cumulative proportion of the total variance greater than 80 percent, that is

$\sum_{i=1}^{m}\lambda_i / \sum_{i=1}^{14}\lambda_i \geq 80\%$, where $\lambda_1,\cdots,\lambda_{14}$ are the 14 eigenvalues of R with $\lambda_1 \geq \cdots \geq \lambda_{14}$.

Step 2: For each x_i (i=1, 2, …, 14), we calculate the correlation between x_i and each principal component f_j, j = 1,2,…, m, that is $\alpha_i = (\alpha_{i1}, \alpha_{i2}, \cdots, \alpha_{im})$, and construct the commuality $H_i \equiv h_i^2 = \alpha_{i1}^2 + \alpha_{i2}^2 + \cdots + \alpha_{im}^2$.

Step 3: Determine the weights $a = (a_1, a_2, \cdots, a_{14})$ of factors $x_1, x_2, \cdots, x_{14}$ in their corresponding categories as follows

$$\left(\frac{H_1}{\sum_{i=1}^{9}H_i}, \frac{H_2}{\sum_{i=1}^{9}H_i}, \frac{H_3}{\sum_{i=1}^{9}H_i}, \frac{H_4}{\sum_{i=1}^{9}H_i}, \frac{H_5}{\sum_{i=1}^{9}H_i}, \frac{H_6}{\sum_{i=1}^{9}H_i}, \frac{H_7}{\sum_{i=1}^{9}H_i}, \frac{H_8}{\sum_{i=1}^{9}H_i}, \frac{H_9}{\sum_{i=1}^{9}H_i}, \frac{H_{10}}{\sum_{i=10}^{13}H_i}, \frac{H_{11}}{\sum_{i=10}^{13}H_i}, \frac{H_{12}}{\sum_{i=10}^{13}H_i}, \frac{H_{13}}{\sum_{i=10}^{13}H_i}, 1\right).$$

The indexes for categories y_1, y_2, y_3 are defined as

$$y_1 = \sum_{i=1}^{9} a_i x_i, \quad y_2 = \sum_{i=10}^{13} a_i x_i, \quad \text{and} \quad y_3 = x_{14},$$

Step 4: Determine the weights $b = (b_1, b_2, b_3)$ in each category of y_1, y_2, y_3

$$b = (b_1, b_2, b_3) = \left(\frac{\sum_{i=1}^{9}H_i}{\sum_{i=1}^{14}H_i}, \frac{\sum_{i=10}^{13}H_i}{\sum_{i=1}^{14}H_i}, \frac{H_{14}}{\sum_{i=1}^{14}H_i}\right).$$

The weights of $x_1, x_2, \cdots, x_{14}$ in the composite indigenous index are, respectively,

$$(w_1, w_2, \cdots, w_{14}) = (a_1b_1, a_2b_1, a_3b_1, a_4b_1, a_5b_1, a_6b_1, a_7b_1, a_8b_1, a_9b_1, a_{10}b_2, a_{11}b_2, a_{12}b_2, a_{13}b_2, b_3)$$
$$= \left(\frac{H_1}{\sum_{i=1}^{14}H_i}, \frac{H_2}{\sum_{i=1}^{14}H_i}, \frac{H_3}{\sum_{i=1}^{14}H_i}, \frac{H_4}{\sum_{i=1}^{14}H_i}, \frac{H_5}{\sum_{i=1}^{14}H_i}, \frac{H_6}{\sum_{i=1}^{14}H_i}, \frac{H_7}{\sum_{i=1}^{14}H_i}, \frac{H_8}{\sum_{i=1}^{14}H_i}, \frac{H_9}{\sum_{i=1}^{14}H_i}, \frac{H_{10}}{\sum_{i=1}^{14}H_i}, \frac{H_{11}}{\sum_{i=1}^{14}H_i}, \frac{H_{12}}{\sum_{i=1}^{14}H_i}, \frac{H_{13}}{\sum_{i=1}^{14}H_i}, \frac{H_{14}}{\sum_{i=1}^{14}H_i}\right).$$

We calculate the composite Indigenous Index as $b_1y_2 + b_2y_2 + b_3y_3 = \sum_{i=1}^{14} w_i x_i$.

The Openness Index can be constructed in the similar way. We illustrate as an example by using the two years of 1998 and 2005 to show the procedures in the

construction of the two indices. In the construction of the Openness Index, Table 2 shows that the first seven principal components in 1998 (m=7) and the first six principal components in 2005 (m=6) have the cumulative proportion of the total variance greater than 80 percent. In the construction of the Indigenous Index, the first four principal components in both 1998 (m=4) and 2005 (m=4) have the cumulative proportion of the total variance greater than 80 percent.

Table 3 presents the weights used in the construction of the two indices. For the two years of 1998 and 2005 in the Openness Index, the weights of the y_2 (Economic Freedom) and y_5 (International Engagement) categories have increased, from 0.281 in 1998 to 0.302 in 2005 and from 0.216 in 1998 to 0.233 in 2005, respectively. These two categories of Economic Freedom and International Engagement are playing increasingly important roles in the globalization process. The conventional category of y_1 (Economic Integration) has the second largest weight, showing that it is still an important category in the globalization.

For the two years of 1998 and 2005 in the Indigenous Index, the y_1 category (Institutional Establishment) has a larger weight (0.709, 0.702) than the other two categories of y_2 (Education and Health) (0.230, 0.265) and y_3 (Inflation) (0.061, 0.033). In the y_1 category (Institutional Establishment), the factors x_4, x_6 and x_7 have the similar weights while the other six factors share a smaller weight. Of all the three categories, the y_3 category (Inflation) has a lowest weight. But as a factor in the index, the weight of the inflation factor in 2005 is almost half of that in 1998, implying that the contribution of inflation to indigeneity has become smaller in 2005.

Table 2 Cumulative Proportion (%) of the Total Variance (1998 and 2005)

Openness Index													
	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	γ_8	γ_9	γ_{10}	γ_{11}	γ_{12}	γ_{13}
1998	34.59	49.47	59.34	67.79	74.17	79.07	**83.75**	87.56	90.75	93.52	96.09	98.38	100.00
2005	40.53	53.64	62.73	69.77	75.64	**81.25**	85.27	88.83	91.94	94.43	96.76	98.64	100.00

Indigenous Index														
	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	γ_8	γ_9	γ_{10}	γ_{11}	γ_{12}	γ_{13}	γ_{14}
1998	60.22	68.17	75.66	**81.42**	85.59	89.26	92.23	94.78	96.42	97.69	98.89	99.61	99.84	100.00
2005	63.09	71.28	77.64	**82.93**	87.58	91.23	93.85	96.17	97.75	98.77	99.34	99.75	99.89	100.00

Table 3 Weights in the Two Indices (1998 and 2005)

	Openness Index	y_1				y_2			y_3	y_4		y_5		
		x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{13}
1998	Weights in categories: a_i	0.225	0.294	0.215	0.266	0.268	0.365	0.367	1.000	0.436	0.564	0.328	0.263	0.409
	Weights between categories: b_i	0.265				0.281			0.093	0.145		0.216		
	Weights in the index: w_i	0.060	0.078	0.057	0.071	0.075	0.103	0.103	0.093	0.063	0.082	0.071	0.057	0.088
2005	Weights in categories: a_i	0.256	0.212	0.164	0.368	0.313	0.363	0.324	1. 000	0.574	0.426	0.343	0.338	0.319
	Weights between categories b_i	0.244				0.302			0.086	0.135		0.233		
	Weights in the index: w_i	0.062	0.052	0.040	0.090	0.094	0.110	0.098	0.086	0.078	0.058	0.080	0.079	0.074

	Indigenous Index	y_1									y_2				y_3
		x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{13}	x_{14}
1998	Weights in categories: a_i	0.114	0.099	0.096	0.123	0.096	0.128	0.127	0.107	0.108	0.249	0.247	0.226	0.278	1.000
	Weights between categories: b_i	0.709									0.230				0.061
	Weights in the index: w_i	0.081	0.070	0.068	0.087	0.068	0.091	0.090	0.076	0.077	0.057	0.057	0.052	0.064	0.061
2005	Weights in categories: a_i	0.112	0.097	0.098	0.122	0.115	0.126	0.125	0.113	0.092	0.336	0.239	0.219	0.206	1.000
	Weights between cate gories: b_i	0.702									0.265				0.033
	Weights in the index: w_i	0.079	0.068	0.069	0.086	0.081	0.088	0.088	0.079	0.065	0.089	0.063	0.058	0.055	0.033

Table 4 and Table 5 show, respectively, the ranking of the 8-year average of the Openness Index and the Indigenous Index for our sample economies.[1] In the Openness Index, the two most open or globalized world economies are Hong Kong with an average score of 0.656 and Singapore with an average score of 0.642.[2] The United States ranks 15th in the Openness Index with the average score of 0.488. The ranking of China (105th) and India (109th) are similar in the Openness Index. When considering the two indices, there are 16 economies in the top 20 of the Indigenous Index are also listed in the top 20 of the Openness Index. For example, Hong Kong ranks higher in the Openness Index than in the Indigenous Index. The United States have the same ranking in the two indices. Although China ranks low in the two indices, China has a higher ranking (ranked 89th) in Indigenous Index than in the Openness Index (ranked 105th).

Among the top 10 economies in the two indices, seven of them are European economies. Hong Kong and Singapore are the only two Asian economies that are ranked first and second in the Openness Index. The other ones in the top 10 of the Indigenous Index are Canada, Australia and New Zealand. Asian Economies fail to enter the top 10 in the Indigenous Index, though both Hong Kong and Singapore are situated in the top 20.

[1] The rankings will not make a difference whether one uses the calculated indices here or the further panel normalized indices introduced in the beginning of next section as the latter is equal to the former scaled by a positive constant.

[2] Due to the difference in the methodology, categorization of factors and the sample of economies in construction, the rankings according to the Openness Index in this study are not completely the same as those ranking, in the globalization index in Dreher (2006). However, the rankings are generally consistent with each other. For example, between the two rankings, there are 16 world economies which are similarly included in top 20 of the two indices.

Table 4 Openness Index (Average of 1998-2005)

Ranking/Economy	Score	Ranking/Economy	Score	Ranking/Economy	Score
1 Hong Kong	0.656	42 Bolivia	0.371	83 Mauritius	0.270
2 Singapore	0.642	43 Greece	0.370	84 Russia Fed.	0.269
3 Ireland	0.630	44 Uruguay	0.376	85 Senegal	0.268
4 Netherlands	0.581	45 Botswana	0.365	86 Kenya	0.268
5 Switzerland	0.580	46 Armenia	0.357	87 Indonesia	0.268
6 Sweden	0.563	47 Japan	0.356	88 Ecuador	0.265
7 United Kingdom	0.537	48 Croatia	0.353	89 Tunisia	0.265
8 New Zealand	0.524	49 Turkey	0.342	90 Brazil	0.260
9 Demark	0.519	50 Malaysia	0.341	91 Tanzania	0.259
10 Estonia	0.510	51 Costa Rica	0.338	92 Bangladesh	0.259
11 Austria	0.509	52 Peru	0.332	93 Nigeria	0.258
12 Czeck Republic	0.508	53 Columbia	0.328	94 Georgia	0.255
13 Belgium	0.508	54 Bulgaria	0.325	95 Morocco	0.255
14 Finland	0.502	55 Lesotho	0.323	96 Venezuela, RB	0.250
15 United States	0.488	56 Albania	0.321	97 Malawi	0.247
16 Canada	0.484	57 Argentina	0.320	98 Gabon	0.245
17 Australia	0.475	58 South Africa	0.320	99 Papua N. Guinea	0.245
18 Iceland	0.471	59 Nicaragua	0.319	100 Saudi Arabia	0.241
19 Germany	0.463	60 Ghana	0.317	101 Egypt Arab Rep.	0.240
20 Italy	0.450	61 Paraguay	0.312	102 Madagascar	0.238
21 France	0.439	62 Macedonia	0.311	103 Eritrea	0.231
22 Spain	0.437	63 Mexico	0.309	104 Rwanda	0.220
23 Portugal	0.433	64 Moldova	0.306	105 China	0.218
24 Norway	0.424	65 Guatemala	0.305	106 Yemen, Rep.	0.218
25 Malta	0.419	66 Romania	0.305	107 Belarus	0.215
26 Hungary	0.419	67 Thailand	0.310	108 Kazakhstan	0.214
27 Israel	0.413	68 Philippines	0.299	109 India	0.214
28 Poland	0.408	69 Guyana	0.295	110 Niger	0.209
29 El Salvador	0.406	70 Kuwait	0.295	111 Sierra Leone	0.205
30 Cyprus	0.405	71 Mali	0.291	112 Tajikistan	0.205
31 Trinidad/Tobago	0.388	72 Honduras	0.287	113 Angola	0.200
32 Swaziland	0.384	73 Zambia	0.287	114 Ethiopia	0.193
33 Chile	0.384	74 Ukraine	0.285	115 Vietnam	0.187
34 Solvak Republic	0.383	75 Uganda	0.283	116 Burundi	0.180
35 Lithuania	0.383	76 Kyrgyz Rep.	0.283	117 Congo, Rep.	0.180
36 Taiwan	0.380	77 Cambodia	0.283	118 Azerbaijan	0.173
37 Latvia	0.380	78 Pakistan	0.282	119 Sudan	0.166
38 Korea Republic	0.380	79 Fiji	0.280	120 Lao PDR	0.142
39 Jordan	0.377	80 Dominican Rep.	0.280	121 Iran Islamic Rep	0.123
40 Panama	0.376	81 Sri Lanka	0.277	122 Syrian Arab Rep	0.113
41 Slovenia	0.371	82 Oman	0.275		

Table 5 Indigenous Index (Average of 1998-2005)

Ranking	Economy	Score	Ranking	Economy	Score	Ranking	Economy	Score
1	Denmark	0.856	42	Malaysia	0.538	83	Nicaragua	0.372
2	Iceland	0.835	43	Slovak Republic	0.536	84	Moldova	0.369
3	New Zealand	0.828	44	Latvia	0.525	85	Zambia	0.362
4	Finland	0.827	45	Tunisia	0.523	86	Guatemala	0.349
5	Sweden	0.814	46	Lesotho	0.518	87	Tanzania	0.349
6	Norway	0.807	47	Tunisia	0.518	88	Kenya	0.348
7	Switzerland	0.803	48	Jordan	0.504	89	China	0.342
8	Canada	0.798	49	Brazil	0.489	90	Armenia	0.340
9	United Kingdom	0.789	50	Panama	0.489	91	Albania	0.335
10	Australia	0.781	51	El Salvador	0.487	92	Ethiopia	0.334
11	Singapore	0.766	52	Netherlands	0.478	93	Papua N. Guinea	0.330
12	Germany	0.762	53	Bulgaria	0.473	94	Yemen, Rep.	0.330
13	Austria	0.760	54	Thailand	0.473	95	Russia Fed.	0.326
14	Ireland	0.756	55	Croatia	0.468	96	Ukraine	0.324
15	United States	0.755	56	Guyana	0.463	97	Venezuela, RB	0.320
16	Hong Kong	0.741	57	Saudi Arabia	0.454	98	Cambodia	0.316
17	France	0.708	58	Mexico	0.452	99	Ecuador	0.309
18	Belgium	0.704	59	Argentina	0.452	100	Eritrea	0.306
19	Portugal	0.695	60	Malawi	0.447	101	Paraguay	0.306
20	Chile	0.684	61	Morocco	0.445	102	Kyrgyz Rep.	0.302
21	Japan	0.682	62	Fiji	0.443	103	Syrian Arab Re	0.301
22	Spain	0.677	63	Swaziland	0.441	104	Kazakhstan	0.297
23	Malta	0.676	64	Turkey	0.424	105	Rwanda	0.294
24	Slovenia	0.649	65	Mali	0.419	106	Niger	0.292
25	Cyprus	0.644	66	Egypt, Arab Rep	0.418	107	Belarus	0.291
26	Taiwan	0.641	67	Madagascar	0.417	108	Bangladesh	0.288
27	Israel	0.638	68	Gabon	0.414	109	Iran Islamic Re	0.284
28	Estonia	0.637	69	Colombia	0.410	110	Georgia	0.274
29	Hungary	0.612	70	Bolivia	0.410	111	Vietnam	0.269
30	Italy	0.609	71	India	0.407	112	Pakistan	0.267
31	Czech Republic	0.603	72	Ghana	0.407	113	Indonesia	0.263
32	Lithuania	0.595	73	Philippines	0.405	114	Azerbaijan	0.255
33	Costa Rica	0.590	74	Sri Lanka	0.402	115	Sierra Leone	0.253
34	Botswana	0.584	75	Peru	0.401	116	Nigeria	0.247
35	Greece	0.571	76	Senegal	0.399	117	Lao PDR	0.230
36	Korea, Rep.	0.567	77	Uganda	0.395	118	Burundi	0.228
37	Uruguay	0.559	78	Romania	0.385	119	Sudan	0.211
38	Poland	0.559	79	Mauritius	0.379	120	Tajikistan	0.207
39	Kuwait	0.558	80	Dominican Rep.	0.378	121	Angola	0.168
40	Oman	0.545	81	Macedonia, FYR	0.377	122	Congo, Rep.	0.157
41	South Africa	0.543	82	Honduras	0.375			

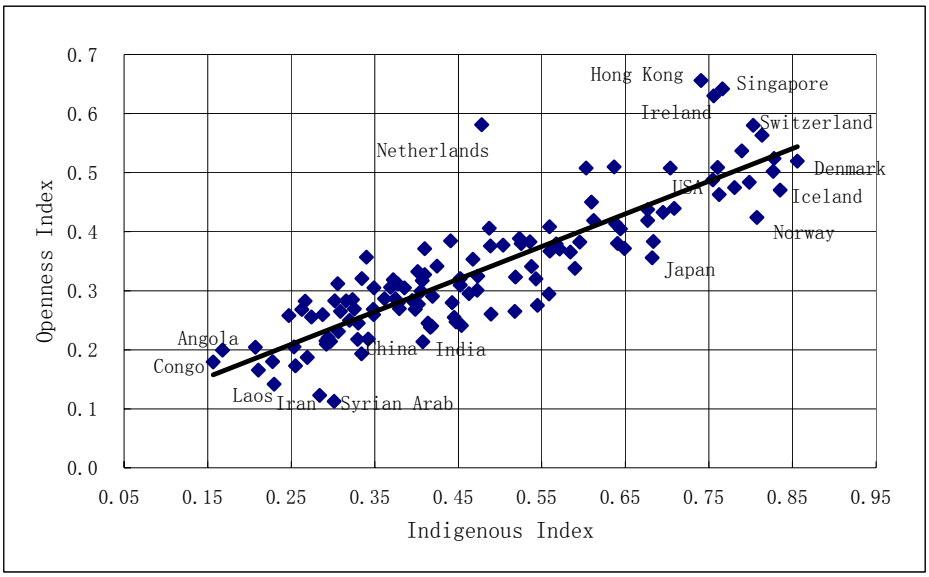

Figure 1 Scatter of the Openness Index and Indigenous Index (Average 1998-2005)

Figure 1 presents the scatter plot diagram and the trend line for the 8-year average of the two indices. A general impression is that the economies with a high level of openness also perform highly in indigenous factors. Among the countries, Syrian Arab Republic has the lowest Openness Index (0.113) with a low Indigenous Index (0.301) and Congo has the lowest Indigenous Index (0.157) with a low Openness Index (0.180). The United States has a high performance in both indigenous and openness factors, while China has a low performance in both indigenous and openness factors. The Netherlands seems to be an outlier in the scatter plot diagram as she has a very high ranking in the Openness Index (0.581) but an unmatched low ranking in the Indigenous Index (0.478). Denmark has the highest ranking in the Indigenous Index (0.856) and also a high ranking in the Openness Index (0.519). Syrian Arab Republic and Iran are the two economies whose performance in indigenous factors has dominated their performance in the openness factors although they have very low ranking in both indices.

3. Commutative Effects of Openness and Indigeneity

Next, we examine the relationship between openness and indigeneity by comparing the openness effect on indigeneity and the indigeneity effect on openness in the same period. First, we need to deal with the annual index data by further conducting panel normalization. We transform the originally calculated index $\{x_{it}\}$ to $\{z_{it}\}$ with $z_{it} = (x_{it} - a)/(b - a)$ for the two indices, where a and b are the worst and best levels of the openness or indigeneity in an economy. Assume that the worst levels for the two indices are both zero, i.e. $a = 0$, and that the best levels of the two indices are their respective sample maximum, i.e. $b = \max_{i,t}\{x_{it}\}$. Then the normalized index is $z_{it} = x_{it}/(\max_{i,t}\{x_{it}\})$ with $z_{it} > 0$ in the sample.

We specify the following static panel data model for the indigeneity effect on openness

$$y_{it} = \alpha_i + m(x_{it}) + u_{it}, \tag{1}$$

where the dependent variable y_{it} is the logarithm of the panel normalized Openness Index for the ith country in the tth time period, x_{it} is the logarithm of the the Indigenous Index, and α_i is the combined effects of unobserved country characteristics, which can be considered to be a constant, a fixed effect, or a random effect. The stochastic term u_{it} is independent and identifically distributed with mean zero and constant variance σ_u^2. The nonparametric function $m(\cdot)$ is unknown and its derivative $\beta(x_{it}) \equiv m'(x_{it})$ represents the indigenous elasticity of openness at x_{it} (Ullah and Roy 1998). The linear parametric specification (Judge *et al*. 1985) of the static model is

$$y_{it} = \alpha_i + x_{it}\beta + u_{it}, \tag{2}$$

which is the parametric case in (1) with $m(x_{it}) = x_{it}\beta$. The coefficient β represents the indigenous elasticity of openness, which is a constant across countries. Models (1) and (2) become the panel data model for the openness effect on indigeneity when y_{it} is exchanged with x_{it}. The nonparapetric and parametric estimates of the openness elasticity of indigeneity can be obtained in the same way.

Table 6 shows the results about the parametric specification test and estimation. The Wald F-test is used to test the null hypothesis of no fixed effects. In both models of the indigeneity effect on openness and the openness effect on indigeneity, the homogeneity of the intercept is rejected, and hence the coefficient estimate of the constant intercept models is biased and fails to take into account the heterogeneity of countries in our sample. For both models, the magnitudes of elasticities from the fixed effects model are quite different from those of the random effects model. The Breusch-Pagan LM test is used to test the null of no correlation between $\alpha_i + u_{it}$ and $\alpha_i + u_{is}$ ($t \neq s$). The results for the two models show that the random effects models are chosen. The Hausman's specification test is used to test the null of no difference between fixed effects and random effects. The null hypothesis of no systematic difference in the two coefficients is rejected, which also imply the random effects specification. The random effects model in the parametric specification is more appropriate for our sample. All the coefficient estimates in the models are significant and positive, meaning that both openness and indigeneity have significant and positive effects on each other.

Table 6 Parametric Model Specification and Elasticity Estimation

	Indigeneity Effect on Openness			Openness Effect on Indigeneity		
	Constant intercept	Fixed effects	Random effects	Constant intercept	Fixed effects	Random effects
β Coefficient (t-ratio)	0.7395 (44.003)	0.1573 (4.031)	0.4467 (14.176)	0.8997 (44.033)	0.104 (4.031)	0.2790 (10.364)
Wald F-Test for Fixed Effects		34.606			69.326	
Breusch-Pagan Test for Random Effects		1985.3			2144.2	
Hausman Test: Fixed or Random Effects		138.65			478.62	

It is noted from the random effects model in Table 6 that the estimate of the indigeneity elasticity of openness (0.4467) is greater than that of the openness elasticity of indigeneity (0.279). Indigeneity has a larger effect on openness than openness has on indigeneity. Indigenous factors have been playing a more important role in an economy's globalization process than openness factors have in the economy's indigeneity development.

This conclusion can further be confirmed by the nonparametric estimation of the panel data model (1), which allows a flexible specification of the function $m(\cdot)$. Table 7 presents the nonparametric local linear estimation results of the derivative $\beta(x)$ at the sample mean, where the kernel function is the Gaussian function, and according to Ullah and Roy (1998) the bandwidth is chosen to be $h = \mathrm{a}\left(nT\right)^{-1/7}$ with a = 0.9, 1.2 and 1.5. For a = 1.2, the bandwidth is $h = 1.2\left(nT\right)^{-1/7} = 1.2 \times 976^{-1/8} \approx 0.51$, for example. The Gauss program is used to conduct the nonparametric estimation. In either the fixed or random effects models, the estimate of the indigeneity elasticity of openness (e.g. 0.216 or 0.424 for a=1.2) is greater than that of the openness elasticity

of indigeneity (e.g. 0.156 or 0.263 for a=1.2). Generally, in the nonparametric estimation, the overall picture is that increasing the constant, a, leads to a slightly larger estimte of $\beta(x)$ at the sample mean for the random effects model and to a slightly smaller estimate for the fixed effects model. But the conclusion that indigeneity has a larger effct on openness than openness has on indigeneity is not altered.

Table 7 Nonparametric Local Linear Estimation of the Elasticity

		Indigeneity Effect on Openness		Openness Effect on Indigeneity	
		Fixed effects	Random effects	Fixed effects	Random effects
a=0.9	$\beta(x)$ at the sample mean (t-ratio)	0.246 (6.366)	0.411 (11.194)	0.167 (6.196)	0.240 (8.448)
a=1.2	$\beta(x)$ at the sample mean (t-ratio)	0.216 (5.516)	0.424 (13.015)	0.156 (5.833)	0.263 (10.011)
a=1.5	$\beta(x)$ at the sample mean (t-ratio)	0.197 (5.032)	0.429 (13.889)	0.147 (5.523)	0.273 (10.834)

4. Granger Causality Test

The general impression from the parametric estimation of the panel data model in Section 3 is that the instantaneous commutative effects of openness and indigeneity are positive and significant. However, on theoretical grounds it is quite plausible to expect intertemporal relationships between openness and indigeneity. Intuitively, a country's openness would depend on her openness or indigeneity in other periods. One might expect that past degrees of openness and indigeneity would help predict current openness or indigeneity. Therefore we need to consider the problem about the causality relationship between openness and indigeneity.

It is noted that the causality relationship between openness and indigeneity may be heterogeneous across countries. A similar attention is given to the causality tests for foreign direct investment and growth in developing countries with a different specification of panel data dynamic model (Nair-Reichert and Weinhold 2001). The heterogeneity of the coefficients of regressors will directly affect the conclusions about the causality relationship. Hence, in this section, we follow Hurlin and Venet (2001) and Hurlin (2007) for a new causality test about the heterogeneity. Hurlin (2007) have presented Monte Carlo simulations which show that the test statistics lead to substantially augment the power of the Granger non-causality tests even for samples with very small T and n dimensions. This new causality test allows one to take into account both the heterogeneity of the causal relationships and the heterogeneity of the data generating process, contrary to the conventional causality test in panel data dynamic models (for example, Holtz-Eakin *et al.* 1988).

In our case, we specify the following dynamic linear model

$$y_{it} = \gamma_i y_{i,t-1} + \beta_i x_{i,t-1} + \alpha_i + u_{it} \tag{3}$$

where u_{it} are independently and identically distributed $(0, \sigma_u^2)$, α_i are the economy specific effects, and autoregressive parameters γ_i and regression coefficients β_i differ across economies. Here a lag length of one is chosen due to the relatively short time series ($T = 8$) for each economy and according to the requirement $T > 5 + 2k$ in Proposition 5 and Proposition 6 of Hurlin (2007), where k is the lagged order. Here we use the same notations as those in Hurlin and Venet (2001) and Hurlin (2007).

We first conduct the homogeneity test for the coefficients β_i

$$H_0: \beta_i = \beta_j \quad \forall (i, j). \tag{4}$$

The test statistic is

$$F_H = \frac{(RSS_0 - RSS_1)/(n-1)}{RSS_1/(n(T-4))} \sim F(n-1, n(T-4)),$$

where RSS_0 is the residual sum of squares from the Within estimator and $RSS_1 = \sum_{i=1}^{n} RSS_{1,i}$, where $RSS_{1,i}$ is the residual sum of squares of the individual estimation obtained under the alternative hypothesis $\beta_i \neq \beta_j \ \exists i, j$. Our calculation using the Gauss program shows that the null hypothsis of homogeneity is rejected for the model with openness or indigeneity as the dependent variable (see the second row in Table 8). Therefore, the regression coefficients β_i are heterogenous.

The homogeneity test implies that we next need to test the homogenous non-causality (HNC) hypothesis under this heterogeneity of regression coefficients β_i. The null is

$$H_0: \beta_i = 0 \quad \forall i = 1, \cdots, n. \tag{5}$$

The alternative is

$$\begin{aligned} H_1: \ & \beta_i = 0 \ \ \forall i = 1, \cdots, n_1; \\ & \beta_i \neq 0 \ \ \forall i = n_1 + 1, \cdots, n. \end{aligned}$$

The alternative means that there exists a subgroup of economies (with dimension n_1) for which the variable x does not Granger cause the variable *y* and another subgroup (with dimension $n - n_1$) for which x Granger causes y. Under the alternative we allow β_i to differ across economies, which is consistent with the test result of the null (4). This alternative is more general than that of Holtz-Eakin *et al*. (1988) as there is causality for all the economies in the sample when $n_1 = 0$; no causality for all the

economies when $n_1 = n$; no causality for some economies when $0 < n_1 < n$. Therefore, in our case, if the null (5) is accepted, the variable x does not Granger cause y for all the economies in the sample. If (5) is rejected and $n_1 = 0$ the variable x Granger causes y for all economies. On the contrary, if $n_1 > 0$, the variable x Granger causes y, but the causality relationship is heterogeneous. Hurlin's (2007) test fails to determine whether $n_1 = 0$ or $n_1 > 0$ when the HNC hypothesis (5) is rejected, but it can be concluded that the variable x does Granger cause y, no matter whether the causality is homogenous or heterogeneous.

Table 8 Homogeneity Test and Homogenous Non-Causality Test

	Openness as the Dependent Variable	Indigeneity as the Dependent Variable
Homogeneity Test for $H_0 : \beta_i = \beta_j \quad \forall (i, j)$	$F_H(121, 488) = 5.157$, reject H_0 at 1% level $\Rightarrow$ β_i are heterogenous.	$F_H(121, 488) = 2.321$, reject H_0 at 1% level $\Rightarrow$ β_i are heterogenous.
Homogenous Non-Causality Test for $H_0 : \beta_i = 0 \quad \forall i$	Z_{HNC} = 23.541, reject H_0 at 1% level $\Rightarrow$ Indigeneity Granger causes Openness	Z_{HNC} = 25.289, reject H_0 at 1% level $\Rightarrow$ Openness Granger causes Indigeneity

The statistic associated to the HNC null hypothesis (5) is given by

$$W_{HNC} = \frac{1}{n} \sum_{i=1}^{n} \frac{RSS_{2,i} - RSS_{1,i}}{RSS_{1,i} / (T - 3)},$$

where $RSS_{2,i}$ is the residual sum of squares under the null (4) for the i-th economy and $RSS_{1,i}$ is defined as above. This statistic does not have a Fischer distribution as the statistic F_H above. By Hurlin's (2007) result, for a fixed T with $T > 5 + 2k$ and some assumptions on the data generating process,

$$Z_{HNC} \equiv \frac{\sqrt{n}\left(W_{HNC} - \mu_T\right)}{\delta_T} \rightarrow N(0,1) \text{ in distribution as n} \rightarrow \infty,$$

where $\mu_T = k(T-2k-1)/(T-2k-3)$ and $\delta_T = (T-2k-1)/(T-2k-3)\sqrt{2k(T-k-3)/(T-2k-5)}$. In our case, $\mu_T = 5/3$ and $\delta_T = 10\sqrt{2}/3$ since $T = 8$ and $k = 1$. Therefore, we can construct the z-statistic Z_{HNC} and conduct the z-test of normality.

The HNC test results are listed in the third row in Table 7. The HNC null hypothesis (5) is rejected in both the models with openness and indigeneity dependent variables. It follows that openness Granger causes indigeniety and indigeniety also Granger causes openness, no matter whether the causality is homogenous or heterogeneous in the sense of Hurlin and Venet (2001). There are bi-directional significant causality relationships between openness and indigeneity.

5. Conclusion and Discussion

Recent studies in globalization have considered the importance of both the quantifiable variables that measure an economy's gain in the globalization process, and domestic factors whose development may impact on economic growth. This paper brings together two sets of factors: openness factors that relate mainly to the external aspect of an economy, and indigenous factors that reflect the internal performance of an economy.

Armed with the data for 122 world economies for the period of eight years, and contrary to the conventional approach of the principle component analysis, a factor analysis method is used to construct the Openness Index and the Indigenous Index to rank the economies in our sample. The result shows that economies that rank high in the Openness Index also rank high in the Indigenous Index, though there are

exceptions. The two indices provide clear indications as to the importance in the successful performance of the two sets of factors.

According to the static panel data models, we show that economies with better performance in indigeneity gernally have a higher degree of openness, and economies with a better performance in openness also have a higher level of indigeneity. There is a positive and significant effect of openness on indigeneity, and vice versa. More importantly, the empirical results shows that the indigenous factors have a larger effect on economic openness than otherwise, suggesting that economies that perform successfully in the process of globalization need to have a strong performance in indigenous factors.

According to the Hurlin-Venet Granger causality test using a heterogenous dynamic panel data model, we show that there is a bi-directional relationship between openness and indigeneity. Improved performance in indigeneity helps to enhance and forecaste openness, while at the same time improved openness performance helps to enhance indigeneity.

The empirical results in this paper raise the importance of indigenous factors. It is often taken for granted that such openness factors as trade, foreign direct investment, and international engagement are all there is in globalization. The missing link is the performance in indigenous factors, which can have a two-folded relationship in the globalization performance of an economy. The direct relationship is one in which the performance of indigenous factors does act as an effective indicator on an economy's external or openness relationship. A more reliable rule of law, for example, provides

convincingly the legal protection the economy provides. Indirectly, the successful performance of openness factors depends significantly on the performance of the indigenous factors. For a developing economy to attract foreign direct investment, for example, a reliable education system guarantees a good supply of human capital.

There are also policy implications for both advanced and less developed economies from the empirical results. The empirical evidence of the commutative effect implies that economies that rank low in the two indices tend to be the less developed economies, which can exercise separately a policy on economic openness and a policy on the improvement in the performance of indigenous factors. The introduction and promotion of an appropriate and effective policy on internal factors can improve the image of a less developed economy both at the international level, which in turn facilitates further development in economic openness. For the advanced economies, their difference in the performance between the two indices requires the introduction of relevant policies that can improve the weaker performance in the two indices.

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Appendix Data and Definition of Variables

The data set composes of a total of 122 world economies and twenty eight factors for the period of 1998-2006. Table A summarizes the definitions and data sources of the twenty eight factors. The missing datum, x_t, can either be followed by two known data in two subsequent years, or between two known data, or after two known data, then we let $x_t = (x_{t+1}+x_{t+2})/2$, or $x_t = (x_{t-1}+x_{t+1})/2$, or $x_t = (x_{t-2}+x_{t-1})/2$, respectively. For the few, mostly developing, countries with a single observed datum (e.g. flow of tourist) all the missing data are estimated with this known datum in each period of the sample. For the few countries with only two observed data, we estimate all the missing data with the average of the two known numbers in each period of the sample. For those countries without the data in a variable, the data of their neighboring countries are used after similar characteristics (economy, populations and so on) are considered and compared. For example, data on Nicaragua's total public spending on education are used for Guatemala and Honduras. The "government transfer" data for the six countries of Ethiopia, Guyana, Madagascar, Nicaragua, Oman and Tajikistan are not available. Since the geographical and population sizes of these six countries are relatively small, we give these unavailable data zero entries.

Definition and Source of Factors:

Total trade flows (% of GDP): Sum of exports and imports of goods and services measured as a share of GDP. Foreign direct investment (% of GDP): Sum of the absolute values of inflows and outflows of FDI recorded in the balance of payments measured as a share of GDP. Gross private capital flows (% of GDP): Sum of the absolute values of direct, portfolio, and other investment inflows and outflows recorded in the balance of payments financial account, excluding changes in the assets and liabilities of monetary authorities and general government. The indicator is calculated as a ratio to GDP in U.S. dollars. Average applied tariff rates (unweighted in %): Unweighted averages for all goods in ad valorem, applied, or MFN rates whichever is available. Trade freedom (%): A composite measure of the absence of tariff and non-tariff barriers that affect imports and exports of goods and services. Financial freedom (%): A measure of banking security and independence from government control. Investment freedom (%): An assessment of the free flow of capital, especially foreign capital. Internet users (per 1,000 people): The number of people with access to the worldwide network. International tourism (% of population): Sum of arrivals and departures of international tourists. International voice traffic (in minutes per person): The sum of international incoming and outgoing telephone traffic. Membership in international organizations: Absolute number of international inter-governmental organizations. Government transfer (% of GDP): Sum of credit and debit divided by GDP. Troop contribution (% of total): The number of peacekeeping troop contribution to UN as the ratio of total peacekeeping troop to UN. Corruption perception index: The degree to which corruption (defined as the abuse of entrusted power for private gain) is perceived to exist among public officials and politicians. Voice and accountability index: The extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression,

freedom of association, and a free media. Political stability index: The perception on the stability of the government in power. Government effectiveness: The combined responses to the quality of public service provision, the quality of the bureaucracy, the competence of civil servants, the independence of the civil service from political pressures, and the creditability of government commitment to policies. Regulatory quality: The provision of market-friendly policies, such as price control, adequacy in bank supervision and other regulation in such areas as foreign trade and business development. Rule of law: The extent to which agents are confident in and abide by the rules in the society, including perceptions in the incidence of crime, effectiveness and predictability of the judiciary and contract enforceability. Control of corruption: The extent of corruption, defined as the exercise of public power for private gain. It is based on the scores of variables from polls of experts and surveys. Property right protection: The degree of property right protection and the extent property right law enforcement. Regulatory scores: A measure on how easy or difficult it is to open and operate a business, and whether regulations are applied uniformly to all businesses. Primary school enrolment rate: The ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to primary school education. Public spending on education (% of GDP): The current and capital public expenditure on education expressed as a percentage of total government expenditure. Primary school pupil-teacher ratio: The number of pupils enrolled in primary schools divided by the number of primary school teachers. Total health expenditure (% of GDP): This consists of recurrent and capital spending from central and local government budgets, external borrowings and grants and donations and health insurance funds. Growth rate of implicit GDP deflator (annual %): The growth of the GDP implicit deflator, which is the ratio of GDP in current local currency to GDP in constant local currency. GDP per capita: Gross domestic product (current dollars) divided by the population.

Sources: *International Financial Statistics*, IMF (May 2007); *World Development Indicators*, World Bank (1998-2006); TRAINS Database, UNCTAD; IDB CD ROMs, WTO; *Index of Economic Freedom*, Heritage Foundation (1998-2006); *The World Factbook*, Central Intelligence Agency; *Balance of Payment Statistics*, United Nations; Department of Peacekeeping Operation, United Nations; *Corruption Index*, Transparency House (1999-2006); *Aggregating Governance Indicators*, World Bank (1999-2006); and *National Accounts*, OECD.