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The Impact of Openness and Indigenous Factors on Economic Growth and Globalization among World Economies*

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Summary

While pro-globalization advocates consider the importance of external factors, critics of globalization tend to focus on the unequal gains in the process of globalization. This paper employs a number of openness and indigenous factors for various world economies for the period 1998-2002 to show that sound performance of indigenous factors are crucial to an economy's globalization process and ultimately growth in per capita GDP. Furthermore, an optimal level of the indigenous factors indicator can be identified, and that successful globalized economies tend to have strong support of a sound performance in their indigenous factors.

Key words: globalization, openness, world economies

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I. Introduction

Recent studies on globalization, economic growth and development have focused on the importance of domestic factors. The debates on globalization include trade and income, inequality and poverty, distortion in the factor market and child labor (Subramanian and Wei 2003, Winters 2002, Deardorff and Stern 2002, Bhagwati 2002, 2004, Aisbett 2005, Frankel 2000, Falvery and Kreickemeier 2005 and Edmonds and Pavcnik 2002). Pro-globalization advocates concentrated on the implications or consequences of external factors. Feldstein (2000), for example, identified five aspects of globalization that 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. Anti-globalization advocates focused on those economic sectors that have lost out or did not receive a rise in factor return (Wallach and Woodall 2004, Stiglitz 2002). The two sides of the globalization debate is noted by Fischer (2003) whom defined globalization to consist of "the ongoing process of greater inter-dependence among countries and their citizens", and noted that the globalization process is "complex and multifaceted" because "globalization is much more than an economic phenomenon" and "the technological and political changes that drive the process of economic globalization have massive non-economic consequences".

In the debates on economic growth and development, studies have called for the performance of domestic issues. The "new growth" model (Barro and Sala-i-Martin 1992, Romer 1990, Mankiw, Romer and Weil 1992) advocated that such endogenous factor inputs as culture, education and human capital are equally important in economic growth. Economic development based on the experience of East Asian economies in the second half of the last century suggests a paradigm of economism (Li 2002, 2005), which argued that sustainable economic development and growth depended on the effective performance of a host of indigenous factors in addition to the attainment of a market capitalist economy. The paradigm of economism (Li 2002) shows that policy focus on poverty reduction rather than pursuit of income equality, the "fertilizer" role of the government in ensuring market friendliness and incentives, the ability to maintain new comparative advantages and a pro-growth political regime are the pre-requisite conditions for successful development.

Hence, the three branches of literature on globalization, economic growth and development have focused their analysis beyond the openness factors like trade and foreign direct investment and argue instead that improved performance in the indigenous factors can help the economy to reap advantages from the globalization process. Our hypothesis is that an economy's globalization performance indicated by the extent of openness is influenced by both economic and non-economic factors. This paper adds to the debate on the relevance of domestic issues in globalization, growth and development by examining the relationship and performance of a number of openness and indigenous factors data for a total of 62 world economies for the period of 1998-2002. This paper examines the impact of both openness and indigenous factors on per capita GDP growth. Section II constructs two indices using openness factors and indigenous factors, ranks the 62 world economies. Section III presents a simulation result based on the regression estimates in Section II. Simulation results show how the performance of the indigenous factors can influence per capita GDP growth, given different level of economic openness. Section IV concludes the paper.

II. Openness and Indigenous Factors

The performance of the external economy is usually seen from such openness factors as the level of international trade, capital inflow and the number of tourists. The clear link between openness factors and an economy's performance in the global community, however, depends on how the domestic sector performed. A more matured capital market, for example, will facilitate greater capital flows, while a more transparent, corruption-free investment environment will attract foreign direct investment. One can even argue that the indigenous factors are the pre-requisite to the successful performance of openness factors. Performance of indigenous factors would lead to the advantages derived from openness.

Empirically, the four categories of economic openness factors considered in Kearney (2005) are categorized into economic integration that consisted of data in total trade flows, foreign direct investment, portfolio capital flows and investment income, technological connectivity that contains an economy's data on internet users, internet hosts and secure servers, personal contacts that incorporate data on international travel and tourism, international telephone traffic, remittances and

personal transfers, and international engagement that comprises a country's involvement in the membership of international organizations, government transfer, international treaties ratified and personnel and financial contribution to United Nations Security Council missions.

This list of openness factors can be improved by incorporating the pattern of external trade in an economy. International trade has conventionally been based on comparative advantage, but trade in industrial goods is determined considerably by the pattern of foreign direct investment and the availability of technology. This can be done by looking separately at an economy's performance in inter-industry trade and intra-industry trade. Inter-industry trade shows an economy's export performance based on its own comparative advantage. Trade statistics are post-trade data that reflect the outcome of trade policies. The performance of inter-industry trade can often be seen from an economy's "revealed comparative advantage" (Balassa 1965, 1977, 1979, 1986). An index of revealed comparative advantage (*RCA*) can be calculated as:

$$RCA_{it,g} = \left(\frac{\left(X_{ig} / X_{wg} \right)}{\left(X_{i} / X_{w} \right)} \right)_{t}, \qquad (1)$$

where X_{ig} denotes economy *i*'s export of commodity *g*, X_{wg} is world export of commodity *g*, X_i is economy *i*'s total export and X_w is total world exports. When an economy's value of $RCA_{it,g}$ exceeds unity, that economy is said to have a revealed comparative advantage in good *g* at time *t*. The total number of export industries with revealed comparative advantage that exceeded unity in each economy are selected and normalized (*NRCA*) to form an indicator for an economy's performance in inter-industry trade ($TRCA_{it}$):

$$TRCA_{it} = \left(\frac{NRCA_{i}}{\underset{i}{MAX}\left\{ NRCA \right\}} \right)_{t}. \qquad (2)$$

In intra-industry trade, economies export and import the same good or service in a given period. Performance in intra-industry trade reflects more on the varieties of goods the economy enjoys due to industrial diversity and technological advancement

than simply on trade flows based on comparative advantages. The extent of global economic integration through market structure and industry pattern is indicated by the level of intra-industry trade that reflected the outcome of investment by multinational enterprises, which have increasingly invested in various world economies in order to reduce cost and compete in the world market. The intra-industry trade index (*IIT*) can be calculated as:

$$IIT_{it} = \left(\frac{\sum_{j=1}^{n_j} \left\{ \left[1 - \frac{\sum_g \left| X_{ij,g} - M_{ij,g} \right|}{\sum_g \left(X_{ij,g} + M_{ij,g} \right)} \right] * 100 \right\}}{\underset{i}{MAX} \left\{ \sum_{j=1}^{n_j} \left(\left[1 - \frac{\sum_g \left| X_{ij,g} - M_{ij,g} \right|}{\sum_g \left(X_{ij,g} + M_{ij,g} \right)} \right] * 100 \right) \right\}} \right)_t , \qquad (3)$$

where $X_{ij,g}$ is the export value of good g from country i to country j; $M_{ij,g}$ is the import value of good g to country i from country j; $i = 1,...,N$; *time* $t = 1,...,T$; product $g = 1,...,G$, and n_j = total number of economy i's trading partners. This effectively is the weighted average of individual industry indices, where the weights are the shares of industries in total trade. The intra-industry trade index is compiled using the UN Comtrade Database, *SITC Rev.3* (UN Comtrade, 1998-2002), for all the 62 economies with all commodities up to 2-digits level.

To construct the Openness Factors Indicator (OFI), data on the 17 external economic openness factors grouped under six categories are available from established international sources of data. There are few exceptions. For example, Hong Kong has little international engagement, say, in government transfer and financial contribution to the United Nations Security Council missions. For the construction of Indigenous Factors Indicator (IFI), data are more constrained in the number of indigenous factors from established sources, though the intention is to obtain as large a number of indigenous factors as possible. A total of 17 indigenous factors are classified under three broad categories. The first category of institutional establishment consists of ten factors of patent applications, corruption perception index, voice and accountability, political stability, government effectiveness, regulatory quality, the rule of law, control of corruption, property right protection and regulatory scores. These institutional factors are considered as proxy measures in an

economy's extent of civility, security and protection of individuals. The second category of education and health consists of five variables of primary school enrolment, public spending on education, primary school pupil-teacher ratio, total health expenditure, and number of physicians per thousand people. The third category concerns the quality of the labor force and contains youth employment and child labor force. These two categories provide indicators on the quality of life.

A total of 62 world economies have data on all or most of these openness factors and indigenous factors for the period since 1998. There is certainly a delay in the provision of data on all these factors. Data for the four years in 1998-2001 are complete, while some data for 2002 are either provisional or unavailable. Table 1 summarizes the categories of external factors and indigenous factors and the sources of data. The openness factors and indigenous factors are used to construct an Openness Factors Indicator (*OFI*) and an Indigenous Factors Indicator (*IFI*), respectively. All the openness and indigenous factors are normalized on a yearly basis, as suggested in Lockwood (2004), before they are used to construct the *OFI* and *IFI*.[1]

We apply the Principal Component Analysis (PCA) to the indicators yearly. There are several advantages of using the PCA method. Since these indicators are likely to be correlated, the PCA can reduce these indicators to fewer variables which capture the maximum variation of the original indicators. The PCA method can also commensurate the different measurement units of these indicators. Furthermore, the PCA method gives data-driven weights to the indicators that form the principal components. The principal components are extracted from the correlation matrix of the variables, in a way that the principal components account for the highest percentage of variation. We apply the PCA to each individual year instead of applying one PCA to the whole sample period. This avoids a sudden change in the indicators of a particular year affecting the rest of years in the sample.

[1] The normalization formulas for the high and low value variables that represent a higher degree of openness (in OFI) and a more advanced indigenous environment (in IFI), respectively, are:
$V_{it} = \left(v_i - \min\{v_1,...,v_N\} / \{\max(v_1,...,v_N) - \min(v_1,...,v_N)\}\right)_t$, and
$V_{it} = \left(\max\{v_1,...,v_N\} - v_i / \{\max(v_1,...,v_N) - \min(v_1,...,v_N)\}\right)_t$. V_{it} is variable V of economy i at time t.

Table 1 The Classification of Openness Factors and Indigenous Factors			
Openness Factors	Data Source	Indigenous Factors	Data Source
1. Economic integration:		1. Institutional establishment:	
i) Total trade flows	IFS	i) Patent applications	WDI
ii) Foreign direct investment	IFS	ii) Corruption Perception	CI
iii) Portfolio capital flows	IFS	Index	
iv) Investment income	BOPS	iii) Voice and accountability	AGI
2. Inter-industry trade:		iv) Political stability	AGI
i) Revealed comparative	UN	v) Government effectiveness	AGI
advantage		vi) Regulatory quality	AGI
3. Intra-industry trade:		vii) Rule of law	AGI
i) Export and import: same	UN	viii) Control of corruption	AGI
product		ix) Property right protection	IEF
4. Technology connectivity:		x) Regulatory scores	IEF
i) Internet users	ITU	2. Education and health:	
ii) Internet hosts	ITU	i) Public spending on	WDI
iii) Secure servers	Net	education	
5. Personal contact:		ii) Primary school pupil-	WDI
i) International travel &	SSCT	teacher ratio	
tourism		iv) Total health expenditure	WDI
ii) International telephone	ITU	v) Physicians per thousand	WDI
traffic		people	
iii) Remittances	BOPS	vi) Primary school enrolment	WDI
iv) Personal transfers	BOPS	3. Quality of labor force:	
6. International engagement:		i) Youth unemployment	WDI
i) Membership in	WFB	ii) Labor force, children10-	WDI
international organizations		14	
ii) Government transfer	BOPS		
iii) International treaties	OFW		
ratified			
iv) Personnel and financial	UNDPI		
contribution to United			
Nations Security Council			
missions			

Notes:
IFS = *International Financial Statistics*, International Monetary Fund;
BOPS = *Balance of Payment Statistics*, United Nations;
UN = *United National Comtrade*, United Nations;
ITU = *International Telecommunication Union Database*, International Telecommunication Union;
Net = *Netcraft Secure*, International Telecommunication Union;
SSCT = *Server Surveys Compendium of Tourism Statistics*, World Tourism Organization;
WFB = *The World Factbook*, Central Intelligence Agency;
OFW = Official websites of selected basket of treaties;
UNDPI = *United National Development Program Indicators*, United Nations;
WDI = *World Development Indicators*, World Bank;
CI = *Corruption Index 1996-2002*, Transparency House;
AGI = *Aggregating Governance Indicators 1996-2004*, World Bank;
IEF = Index of Economic Freedom, Heritage Foundation.

The latent variable model postulates that, in the case of *OFI*, the *OFI* is linearly dependent on a set of observable factors (*V*) and an error term (Rencher 2002), namely:

$$OFI = b_1 V_1 + \cdots + b_\Psi V_\Psi + error, \tag{4}$$

where $V_1, \ldots, V_\Psi$ is set of Ψ factors that are used to capture the openness of an economy. The following procedure is used to compute the principal components (*PC*s):

$$\begin{cases} PC_1 = \alpha_{11} V_1 + \cdots + \alpha_{1\Psi} V_\Psi \\ PC_2 = \alpha_{21} V_1 + \cdots + \alpha_{2\Psi} V_\Psi \\ \quad \vdots \\ PC_L = \alpha_{L1} V_1 + \cdots + \alpha_{L\Psi} V_\Psi \end{cases}, \tag{5}$$

where $\alpha_{11}, \alpha_{12}, \cdots, \alpha_{1\Psi}$ are elements of eigenvector $\alpha_1 = \{\alpha_{11}, \cdots, \alpha_{1\Psi}\}$, and there are a total of L eigenvectors, which are determined by the data. A total of L principal components are computed using successive eigenvectors elements, $\alpha_1, \alpha_2, \ldots, \alpha_L$, corresponding to the largest L eigenvalues, $\lambda_1 > \lambda_2 > \cdots > \lambda_L$, of the factor correlation matrix. The first principal component, PC_1, of the linear combination with maximal variance becomes our *OFI*, which is then normalized by the following procedure:

$$Scaled\ OFI_{it} = \left(\frac{OFI_i - \min_i \{OFI\}}{\max_i \{OFI\} - \min_i \{OFI\}} \right)_t, \tag{6}$$

where $i = 1, 2, \ldots, N$, and $t = 1, 2, \ldots, T$. The scaled *OFI* will take a value of unity when an economy has the best performance in its external environment. These procedures are similarly applied to the construction of the *IFI*.

In constructing the two indicators, the missing values in the country series are replaced by their nearby means.[2] Different weightings are generated from a corresponding principal component analysis for countries that an entire series of a factor is missing. The methodology we use is an improvement on those used in Anderson and Herbertsson (2005) and Dreher (2006). Andersen and Herbertsson (2005) used a single principal component analysis for all the data in their sample

[2] In the Openness Factors Indicators, the maximum number of missing economies in the 1998-2002 sample periods is 4, and their percentage ranged between 5.9% and 11.8%. For the Indigenous Factors Indicator, the corresponding figures for the maximum number of missing economies are 40, and the percentage ranged between 5.9% and 35.3%.

period (1979-2000), and they provided rankings of economies according to the factor scores for each year generated by pooling the years over the sample period. However, taking Lockwood's (2004) suggestion on normalization, the problem in the Anderson and Herbertsson (2005) methodology is that the change in the ranking of one economy in a specific year would change the rankings of other economies over the whole sample period. Dreher (2006) used weightings of principal component analysis from year 2000 for the calculation of indices for each single year from 1970 to 2000. The principal component analysis is meant to give weightings that maximize the variance of the indices, but if weightings generated in 2000 are used for the indicator of all preceding years, the maximum variance effect is lost and the principal component analysis would seem meaningless. We generated the factor scores for each year separately, and therefore can avoid the problem faced by Anderson and Herbertsson (2005), and at the same time the yearly factor scores maximized the variance of the indices.

Table 2 Openness Factors and Indigenous Factors Indicators
(62 World Economies, 1998-2002 Average)

Ranking	Openness Factors Indicator		Indigenous Factors Indicator	
	Economies	Index	Economies	Index
1	Ireland	1.00	Sweden	0.93
2	United States	0.70	Switzerland	0.91
3	Netherlands	0.72	Finland	0.90
4	Switzerland	0.65	Denmark	0.93
5	Sweden	0.65	United States	0.89
6	Finland	0.62	Norway	0.87
7	Singapore	0.64	Canada	0.88
8	Denmark	0.61	Germany	0.88
9	Austria	0.60	Singapore	0.86
10	United Kingdom	0.60	Netherlands	0.84
11	Canada	0.60	New Zealand	0.83
12	New Zealand	0.56	Austria	0.86
13	Australia	0.50	United Kingdom	0.84
14	Norway	0.48	Australia	0.85
15	Germany	0.49	Ireland	0.80
16	France	0.48	Spain	0.74
17	Hong Kong	0.47	France	0.73
18	Portugal	0.40	Japan	0.73
19	Spain	0.38	Portugal	0.72
20	Italy	0.37	Hong Kong	0.71
21	Czech Republic	0.35	Slovenia	0.71
22	Israel	0.32	Italy	0.70
23	Slovenia	0.30	Israel	0.66

24	Hungary	0.27	Czech Republic	0.63
25	Slovak Republic	0.28	Hungary	0.63
26	Japan	0.27	Malaysia	0.53
27	Malaysia	0.26	Chile	0.60
28	Panama	0.25	Greece	0.59
29	Greece	0.24	Poland	0.56
30	Poland	0.23	Saudi Arabic	0.52
31	Korea	0.23	Tunisia	0.48
32	Croatia	0.20	Korea	0.48
33	Argentina	0.19	Panama	0.47
34	Chile	0.17	Slovak Republic	0.47
35	Philippine	0.16	Argentina	0.44
36	Brazil	0.15	Morocco	0.41
37	Russian	0.15	Botswana	0.43
38	Thailand	0.15	Brazil	0.39
39	Mexico	0.14	Thailand	0.40
40	China	0.14	Romania	0.37
41	Turkey	0.13	Egypt	0.36
42	Romania	0.13	South Africa	0.38
43	South Africa	0.14	Croatia	0.37
44	Indonesia	0.12	Sri Lanka	0.34
45	Ukraine	0.12	Turkey	0.32
46	Botswana	0.10	Peru	0.32
47	India	0.11	Mexico	0.30
48	Tunisia	0.11	Venezuela	0.30
49	Colombia	0.10	Colombia	0.30
50	Peru	0.08	Russian	0.29
51	Senegal	0.08	Philippine	0.28
52	Venezuela	0.07	India	0.26
53	Nigeria	0.07	Iran	0.21
54	Egypt	0.07	China	0.22
55	Kenya	0.06	Indonesia	0.16
56	Morocco	0.05	Ukraine	0.21
57	Pakistan	0.05	Senegal	0.19
58	Sri Lanka	0.04	Kenya	0.13
59	Uganda	0.04	Pakistan	0.12
60	Saudi Arabic	0.03	Uganda	0.10
61	Iran	0.03	Bangladesh	0.03
62	Bangladesh	0.01	Nigeria	0.00

Table 2 gives the five-year (1998-2002) average of the *OFI* and *IFI* indicators. The ranking based on the five-year average shows that the top 10 economies in the two indices are mainly advanced economies in North America and Western Europe. Singapore is the only Asian economy that scored a position in the top 10. Most of the remaining European Union economies are included when the scores are extended to the top 20. Hong Kong is the other Asian economy that is included in the top 20 of the

two indicators. An economy can vary considerably between the two indicators. For example, Japan ranked 18th in the *IFI*, but ranked 26th in the *OFI*. Another example is Indonesia whom ranked 44th and 55th in *OFI* and *IFI*, respectively. Table 2 shows that economically weaker economies tend to rank lower in the two indicators. Effectively, economies that ranked below 30th are all developing economies.

We make use of the two indicators and postulate a hypothesis that economies with a strong performance in indigenous factors do enjoy a higher rate of per capita GDP growth at different level of economic openness, which is considered as a good proxy indicator for globalization. We first divide the *IFI* into *k* portions using percentiles, shown in Equation (7).

$$IFI_t = \left\{ \min_i \{IFI\}, \cdots, \left(\frac{100}{k}\%^* N\right)^{th} IFI \right\}_t, \left\{ \left(\left(\frac{100}{k}+1\right)\%^* N\right)^{th} IFI, \cdots, \left(\left(2\times\frac{100}{k}\right)\%^* N\right)^{th} IFI \right\}_t, \cdots, \left\{ \left(\left((k-1)\times\frac{100}{k}+1\right)\%^* N\right)^{th} IFI, \cdots, \left(\left(k\times\frac{100}{k}\right)\%^* N\right)^{th} IFI \right\}_t. \quad (7)$$

For example, we can divide the *IFI* of year *t* into three portions, so *k = 3*, with 33.33% of the countries in each portion. The first portion is made up of the minimum *IFI* in year *t* to the 33rd *IFI* in year *t.* We then assign a dummy variable, D_κ, where $\kappa=1,\ldots, k,$ to each of the last (*k-1*) portions of *IFI*, namely $D_2, \cdots D_k$. The D_κ dummy takes a value of unity if IFI_{it} falls into the κ^{th} portion, otherwise it takes a value of zero. Since the *IFI* is a measure of the indigenous environment of an economy, and the higher the *IFI* value an economy has, the better is its indigenous environment, that is, an economy with $D_\kappa = 1$ has a better indigenous environment than an economy having $D_{\kappa-1} = 1$.

The following model is used to examine how indigenous factors can affect the outcome of openness on growth:

$$\ln y_{it} = \alpha + \beta_1 \ln OFI_{it} + \beta_2 \ln OFI_{it} * D_{2,it} + \cdots + \beta_k \ln OFI_{it} * D_{k,it} + \varepsilon_{it}, \quad (8)$$

where y_{it} is the real GDP per capita deflated by purchasing power parity of economy *i* at time *t*. For economy *i* who has the dummy $D_\kappa = 1$, the regression become:

$$\ln y_{it} = \alpha + \beta_1 \ln OFI_{it} + \beta_\kappa \ln OFI_{it} + \varepsilon_{it}, \text{ or} \tag{9}$$

$$\ln y_{it} = \alpha + (\beta_1 + \beta_\kappa)\ln OFI_{it} + \varepsilon_{it}.$$

For another economy *j* which has the dummy $D_{\kappa-c} = 1,$ for any $c > 0$, i.e. economy *j*'s indigenous environment is not as good as economy *i*'s the regression becomes:

$$\ln y_{jt} = \alpha + \beta_1 \ln OFI_{it} + \beta_{\kappa-c} \ln OFI_{jt} + \varepsilon_{jt}, \text{ or} \tag{10}$$

$$\ln y_{jt} = \alpha + (\beta_1 + \beta_{\kappa-c})\ln OFI_{jt} + \varepsilon_{jt}.$$

Since we hypothesize that a higher performance in the indigenous factors would bring a higher marginal effect of openness on economic growth, we expect to see $\beta_1 + \beta_{\kappa-c} < \beta_1 + \beta_\kappa$. Thus, generalizing to all the *k* dummy variables, if a better indigenous environment has a positive impact of openness on growth, we expect to see $\beta_1 < \beta_1 + \beta_2 < \beta_1 + \beta_3 < \ldots < \beta_1 + \beta_k$, suggesting that a strong performance in an economy's ranking of the indigenous factors could enable an economy to benefit more from openness. Two Wald tests are conducted to test the significance of the coefficient estimates. The first Wald test is to see if a low performance in an economy's indigenous factors is a constraining factor to economic growth. We propose an alternative hypothesis with $\beta_1 < 0$, which implies that if an economy has an extremely weak performance in its indigenous factors (reflected in the *IFI* value falling into the first partition of the indicator), openness would bring negative effects on economic growth, namely:

$$\begin{aligned} &Ho^1 : \beta_1 = 0 \\ &Ha^1 : \beta_1 < 0. \end{aligned} \tag{11}$$

The second Wald test tests if an economy's *IFI* does significantly affect the marginal effect of a country's openness on its real per capita GDP growth rate:

$$\begin{aligned} &Ho^2 : \beta_1 + \beta_\kappa = 0 \ for\ \kappa = 2, \cdots, k. \\ &Ha^2 : \beta_1 + \beta_{\kappa-1} < \beta_1 + \beta_\kappa \ for\ \kappa = 3, \cdots, k. \end{aligned} \tag{12}$$

The alternative hypothesis, Ha^2, states that countries that have a better performance in the indigenous factors should benefit more from openness in terms of economic growth.

We applied the within-GLS method to estimate Equation (8), but the emergence of the singular matrix problem due probably to the short sample period led us instead to use the pooled-GLS with White-Heteroskedasticity consistent standard error and covariance. Equation (8) is estimated with k = 3, 4, 8 and 10. Table 3 shows the empirical estimation of the pooled-GLS results for the 62 countries for the sample period of 1998-2002.

For estimates with k = 3 and k = 4 in Table 3, all the estimates are significant at 1 percent level. In these two cases, the estimate for β_1 is not negative, but is significantly different from zero. This suggests that a low performance in indigenous factors do not adversely affect the effect of globalization on economic growth, though this may due to the small size of k. When the size of k is small, the marginal effect of indigenous factors on globalization and economic growth may not be obvious. The F-tests reject the null hypothesis of Equation (8), and suggests that as economies improve their indigenous factors, the marginal effect of globalization on their growth increases.

Table 2 Pooled-GLS Estimates of 62 World Economies, 1998-2002

Coefficients	k = 3	k = 4	k = 8	k = 10
α	7.5159	7.3161	7.5144	7.5269
	(0.0722)*	(0.0861)*	(0.0967)*	(0.0956)*
β_1	0.2904	0.3591	-0.0324	-0.0868
	(0.0270)*	(0.0360)*	(0.0911)	(0.0920)
β_2	0.3036	0.2260	0.3593	0.3916
	(0.0073)*	(0.0163)*	(0.0729)*	(0.0739)*
β_3	0.3690	0.3472	0.4956	0.5224
	(0.0097)*	(0.0174)*	(0.0730)*	(0.0731)*
β_4		0.3421	0.5961	0.5561
		(0.0188)*	(0.0750)*	(0.0749)*
β_5			0.6334	0.6447
			(0.0762)*	(0.0759)*
β_6			0.7027	0.6757
			(0.0766)*	(0.0770)*
β_7			0.6847	0.7346
			(0.0777)*	(0.0771)*
β_8			0.6894	0.7523
			(0.0779)*	(0.0782)*
β_9				0.7342
				(0.0787)*
β_{10}				0.7427
				(0.0788)*
F-test†	0.0000	0.0000	0.0000	0.0000
Adj. R^2	0.999704	0.999624	0.999670	0.999745
Wald Test†	0.0000	0.0000	0.0000	0.0000

Notes: Figures in parentheses are standard errors.
* = significance at 1% level.
† = significance at 5% level

For estimates with $k = 8$ and $k = 10$, and with the exception of the insignificant estimate for β_1, all the estimates are significance at 1% level. For these estimated values of k, the estimate of β_1 is negative, which means that economic growth in an economy with low performance in indigenous factors is adversely affected by globalization. Similar to the results of $k = 3$ and $k = 4$, the F-tests reject the null hypothesis of Equation (8). This confirms that improvement in the performance of indigenous factors in an economy can improve the marginal effect of globalization on growth.

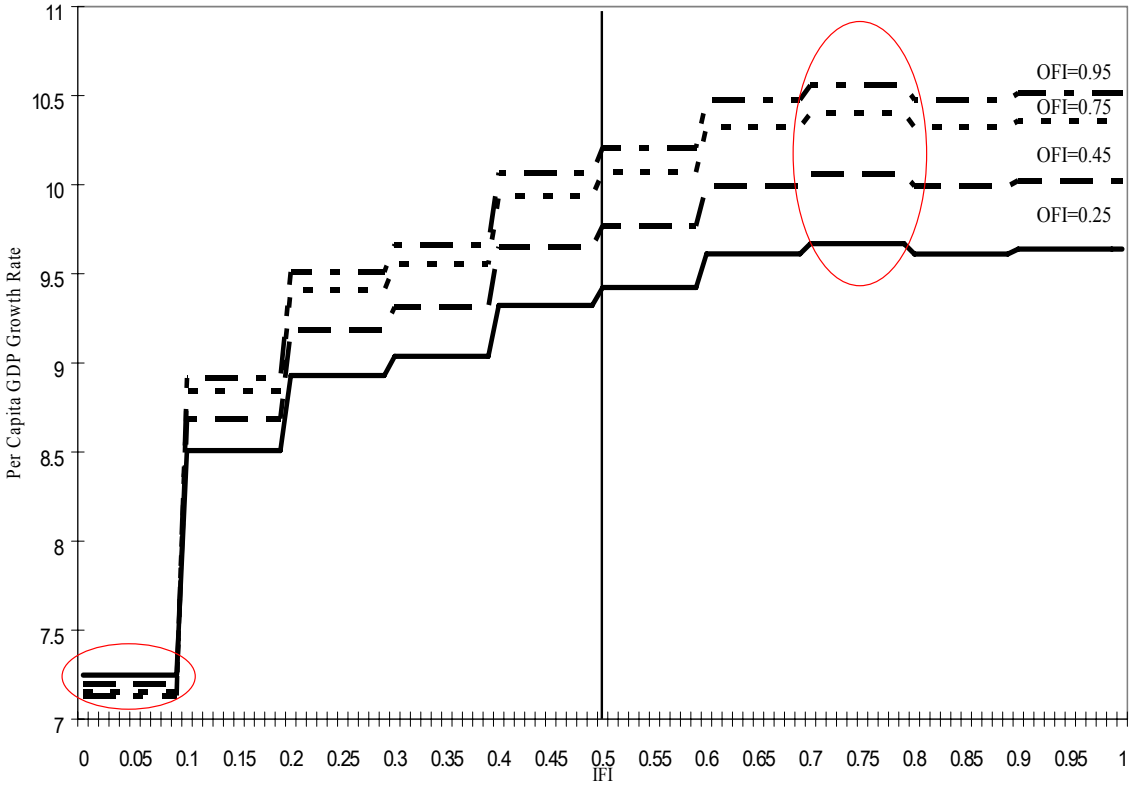
III. Optimal Performance in Indigenous Factors

While the previous section shows that a good performance in indigenous factors formed a pre-requisite for an economy to gain real per capita GDP growth, this section uses a simulation method to work out the optimal performance in an economy's indigenous factors in order to achieve a maximum gain in economic growth under globalization. From the estimation result of *k=4, 8* and *10*, we suspect that economies which have the top scores in IFI might be indigenously too restrictive for openness. Hypothetical economies are compared in order to see how an economy performs in growth and globalization given a different level of performance in the indigenous factors. This can be seen from two hypotheses. First, given two externally homogeneous economies (namely, economies with same performance in the *OFI*), heterogeneity in the performance of *IFI* will result in differences in economic growth and development. Secondly, given homogeneity in the performance of *IFI* among different economies, those economies with a better performance in the *OFI* will result in higher economic growth.

We make use of the empirical result with $k = 10$ in Table 2 to simulate the growth of GDP per capita for a total of 100 hypothetical economies with an incremental change of 0.01 in the *IFI* that ranged from 0 to 1. We set different values of the *OFI* that are either below or above the median value. A simulated series of per capita GDP figures are generated from the empirical results with $k = 10$ in Table 2.

For example, when *OFI* = 0.25, and with $D_{3,it} = 1$ (namely, the range of *IFI* is between 0.2 and 0.3, and other dummies equal to zero), the simulated GDP per capita growth is 8.92904 (i.e. 7.52687 + (-0.08675) * ln (0.25*100) + (0.522359) * ln (0.25*100) * 1). These simulated per capital GDP growth rates are plotted against the *IFI*, and a step function is presented separately for four values of *OFI* (at 0.25, 0.45. 0.75 and 0.95) as shown in Figure 1.

Figure 1 The Effect of Economic Openness on Growth

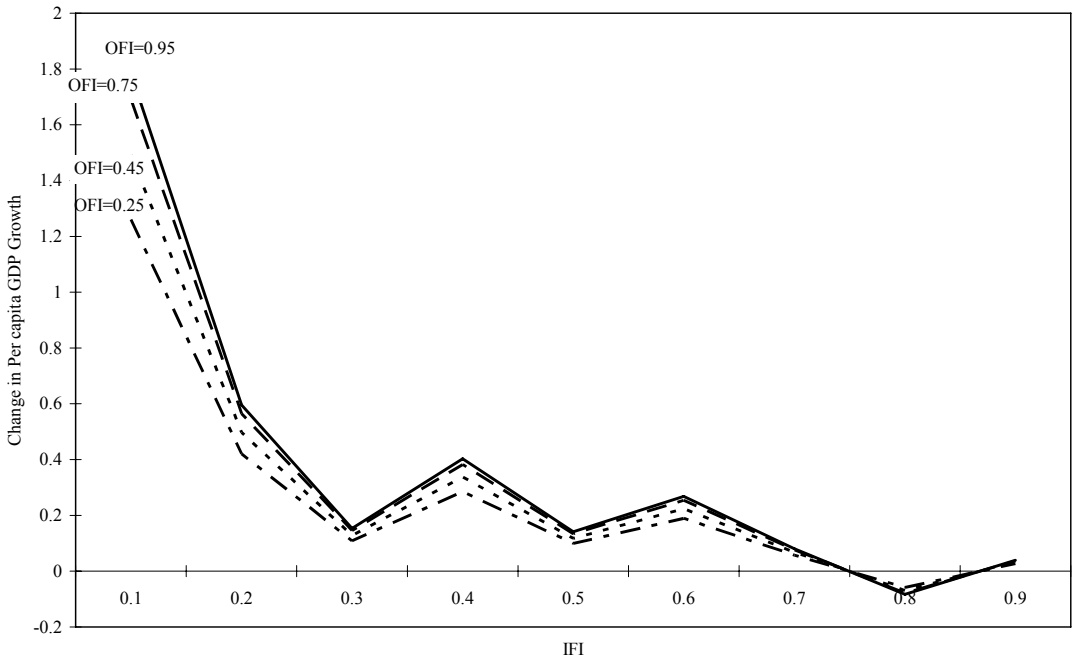


The first observation in Figure 1 is that economies with a better performance in openness (with higher *OFI*) produced a higher level of per capita GDP growth at the level of *IFI* above 0.1. In economies with their *IFI* below the median, a higher performance in *OFI* always produces a higher economic growth measured in GDP per capita, except at an extremely low level when *IFI* is below 0.1. The second observation is that, when the *IFI* is above median, economic growth will keep rising regardless of the performance in the *OFI* until an economy's *IFI* reaches the range of 0.7 and 0.8, beyond which the growth rate of GDP per capita declined. This suggests

that the 0.7 to 0.8 range of the *IFI* is the optimal level, and economies will reach their highest possible growth rates given their *OFI*.

When the value of *OFI* lies between 0 and 1, the marginal contribution of *IFI* to the per capita GDP growth of an economy is positive if the value of *IFI* lies between 0 and the optimal level. When the value of *IFI* is above its optimal level, the marginal contribution of *IFI* to an economy's GDP per capita growth is negative.[3] In short, if an economy has an *IFI* value below 0.1, a lower value of *OFI* actually produces a higher per capital GDP growth. So long as the value of *IFI* lies above 0.1, the marginal contribution by the different level of *OFI* to per capita GDP growth is positive. On the contrary, when *IFI* lies between 0 and 0.1, the marginal contribution of *OFI* to per capita GDP growth is negative.[4]

Figure 2 The Marginal Effect of OFI on Growth



[3] This can also be seen if Equation (8) is modeled as a continuous or differentiable function, where $0< i < 1$, and *IFI** represents the optimal value:

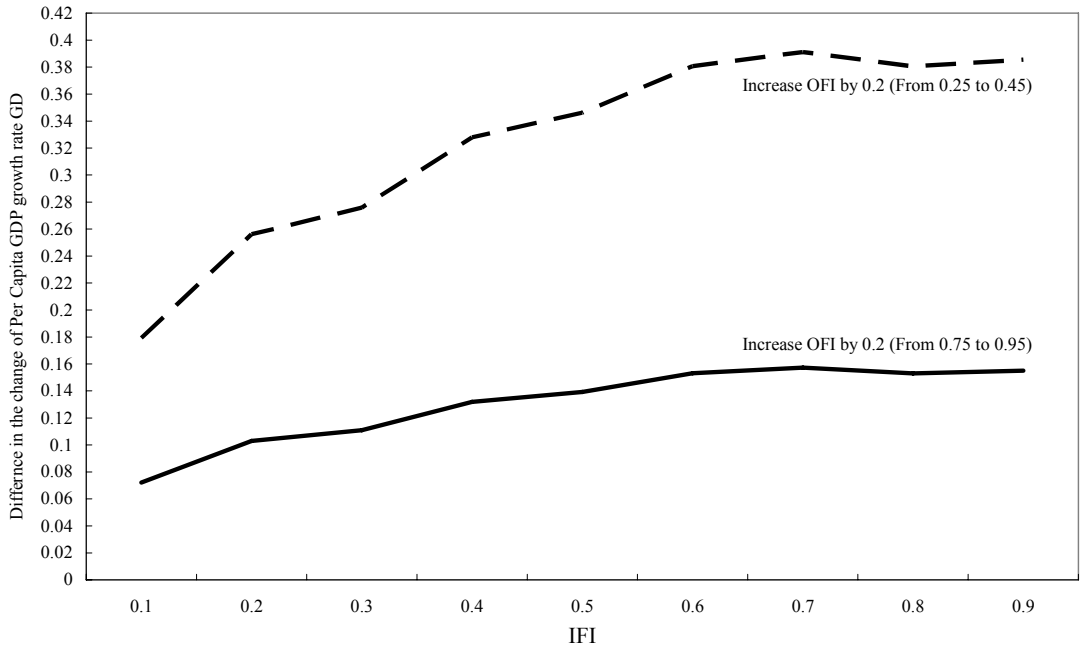
$$\left.\frac{\partial \ln y}{\partial IFI}\right|_{0<IFI<Median\ ,OFI=OFI_i} > 0; \qquad \left.\frac{\partial \ln y}{\partial IFI}\right|_{IFI<IFI^*;OFI=OFI_i} > 0; \qquad \left.\frac{\partial \ln y}{\partial IFI}\right|_{IFI>IFI^*;OFI=OFI_i} < 0$$

[4] When the function is a differentiable, the results can be summarized as follows:

$$\left.\frac{\partial \ln y}{\partial \ln OFI}\right|_{0.5<IFI<1} > 0; \qquad \left.\frac{\partial \ln y}{\partial \ln OFI}\right|_{0.1<IFI<0.5} > 0; \qquad \left.\frac{\partial \ln y}{\partial \ln OFI}\right|_{0<IFI<0.1} < 0$$

The analysis can be extended to examine the marginal effect of both *OFI* and *IFI*. By plotting the change in the per capita GDP growth rate against the *IFI* at different level of the *OFI*, Figure 2 shows that at different level of *IFI*, a higher *OFI* leads to a larger change in growth rate of per capita GDP.[5] However, as shown in Figure 3, the marginal effect of *IFI* on the change in growth rate of per capita GDP at different level of *OFI* is increasing at a decreasing rate. Furthermore, Figure 3 shows that when the *OFI* value is below median, the marginal contribution of economic openness towards the economics growth is larger than that when *OFI* is above median.[6]

Figure 3 The Effect of a Change in OFI



Various policy recommendations can be suggested from the above empirical work and simulation analysis. Firstly, a more globalized economy indicated by the

[5] The marginal effect can be summarized as follows when a differentiable equation is used:

$$\left.\frac{\partial \ln y}{\partial IFI}\right|_{OFI=0.25} < \left.\frac{\partial \ln y}{\partial IFI}\right|_{OFI=0.45} < \left.\frac{\partial \ln y}{\partial IFI}\right|_{OFI=0.75} < \left.\frac{\partial \ln y}{\partial IFI}\right|_{OFI=0.95}$$

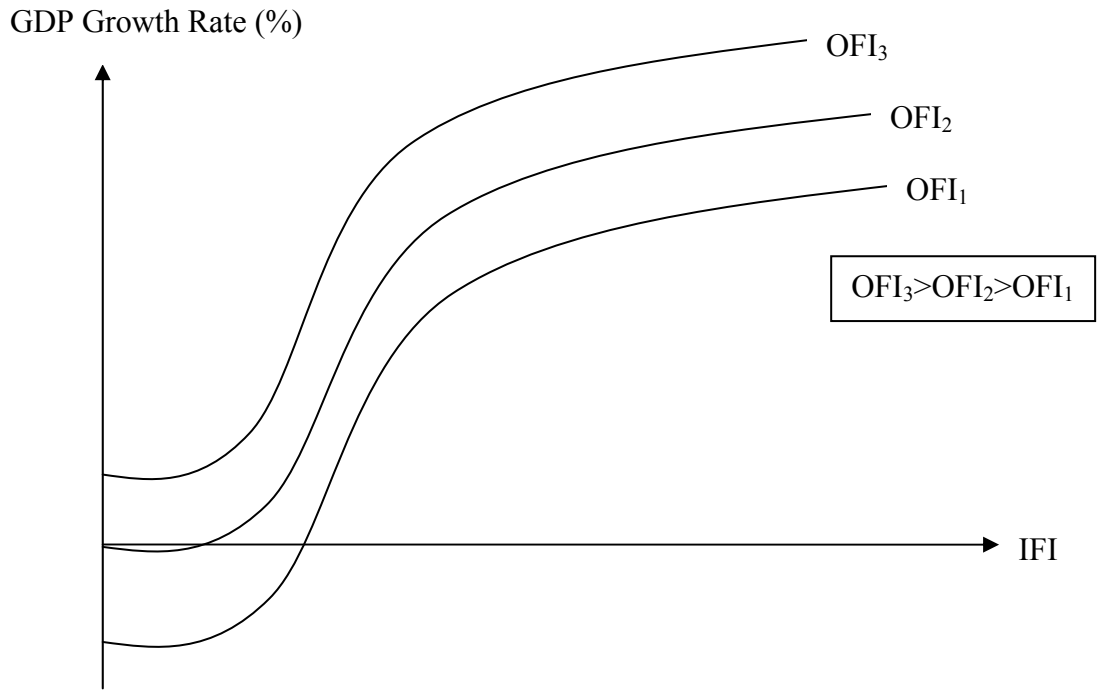
[6] The marginal effect can be summarized as follows when a differentiable equation is used:

$$\left.\frac{\partial \ln Y}{\partial \ln OFI_{\,Below\ Median}}\right|_{IFI=IFI_i} > \left.\frac{\partial \ln Y}{\partial \ln OFI_{\,Above\ Median}}\right|_{IFI=IFI_i}$$

higher performance in economic openness is not always leads to higher economic growth, for those economies with $0 < IFI < 0.1$, they should improve on the *IFI* in order to reap additional gain from openness and ultimately globalization Secondly, economies whose *IFI* is above 0.1 but below the optimal range (0.7 to 0.8) should aim to improve the performance of the indigenous factors, hoping gradually to reach the optimal level..

A pattern of relationship between economic growth, performance of the openness factors and indigenous factors seems to have emerged from the simulation analysis. Consider the picture in Figure 4. Once the performance in the indigenous factors has reached a minimum level, improvement in indigenous factors will lead to a larger per capita GDP growth rate at a higher level of openness. Thus, at a higher level of openness (OFI_3), for example, the per capita GDP growth rate will be higher as the performance of indigenous factors is made.

Figure 4 The Relationship between Growth, Openness and Indigenous Factors



To see how the 62 world economies perform in the 1998-2002 period, Table 3 maps out the sample period average in five different ranges of *OFI* and *IFI*. Individual economies can consider their own positions in the ranking of the two indicators, and

compare the performance with other economies, including the periodic average in the GDP per capita growth rates. There are seven mainly poor developing economies (Bangladesh, Indonesia, Kenya, Nigeria, Pakistan, Senegal and Uganda) that have the lowest rankings in both indicators. On the contrary, those economies that performed strongly in both *OFI* and *IFI* are mainly developed economies (Austria, Denmark, Finland, Netherlands, Singapore, Sweden, Switzerland, United Kingdom and USA). Most developed economies have performed stronger in *IFI* than in *OFI*. Ireland is the only economy that has a stronger performance in *OFI* than in *IFI* in the sample period (measured in purchasing power parity constant 2000 price, Ireland's GDP per capita is highest among the 62 countries).

This finding is in line with our hypothesis and suggests that the performance of indigenous factors is the more fundamental constraint in the globalization process. Most economies that are strong in the performance of *IFI* are also strong in the performance of *OFI*, but not the reverse. In other words, it would be appropriate for economies to improve their indigenous conditions and environment before they can gain from openness and globalization. Economies have to achieve a reasonable level of performance in indigenous factors before gaining the benefits from openness factors. Indigenous factors are the pre-requisite to openness, growth and globalization. There are a number of economies (Argentina, Botswana and so on) that have achieved a median in *IFI*, but showed low performance in *OFI*. The 0.61 to 0.80 range of the *IFI* seems to be the critical range, as virtually all industrially advanced economies achieved an *IFI* score above 0.61.

When considering the average per capita GDP growth rates, Table 3 shows that a number of economies in the second lowest (0.21 – 0.40) range of *IFI* experienced a relative high growth rate in the sample period. For example, China has a growth rate of 6.749 percent and Russian Federation had 6.381 percent and so on. This suggests that these economies have to improve their *IFI* before reaping the gain from openness and globalization. Among the developing economies, the African economies (e.g. Uganda, Kenya and Senegal) are the weakest performers in both the *OFI and IFI*, while the middle-ranking economies are the few Asian (e.g. Thailand and Malaysia) and Latin American (e.g. Panama and Chile) economies. Other Asian economies (e.g. India, Indonesia, Philippines and Sri Lanka) performed poorly in both *OFI* and *IFI*. The group of developing economies that have reached the range of

0.61 – 0.80 in the *IFI* are mostly Eastern European economies (e.g. Hungary, Slovenia and Czech Republic). The Eastern European economies will probably be the next group of countries that would benefit more in the globalization process.

Table 3 The OFI – IFI Matrix of World Economies, 1998-2002 Average

		Indigenous Factors Indicator (*IFI*)				
	Range	0.00 - 0.20	0.21 - 0.40	0.41 - 0.60	0.61 - 0.80	0.81 - 1.00
Openness Factors Indicator (*OFI*)	0.00 - 0.20	Uganda (4.049) Bangladesh (3.025)* Senegal (2.322) Nigeria (1.575)* Indonesia (1.408) Pakistan (1.398) Kenya (-1.343)	China (6.749) Russian Fed. (6.381) Ukraine (5.692) India (3.287) Romania (3.071) Egypt (2.932) Iran (2.786) Sri Lanka (1.928) Philippines (1.239) Brazil (1.229) S. Africa (1.227) Mexico (1.001) Peru (0.768) Turkey (-0.096) Colombia (-0.807) Venezuela (-3.697)	Botswana (8.615) Tunisia (3.198) Thailand (2.911) Chile (1.072) Morocco (0.720) Saudi Arab. (-0.938) Argentina (-5.887)		
	0.21 - 0.40		Croatia (3.654)	Korea (5.957) Greece (4.207) Slovak Rep. (3.341) Poland (2.981) Malaysia (2.945) Panama (0.661)	Hungary (3.869) Slovenia (3.858) Czech Rep. (3.354) Spain (2.671) Portugal (1.945) Italy (1.590) Japan (0.477) Israel (-0.096)	
	0.41 - 0.60				Hong Kong (3.346) France (2.201)	New Zealand (3.150) Canada (2.829) Australia (1.821) Norway (1.374) Germany (1.175)
	0.61 - 0.80					Singapore (4.082) Sweden (2.500) Finland (2.161) U.K. (2.102) Denmark (1.788) Austria (1.723) Netherlands (1.617) USA (1.455) Switzerland (1.095)
	0.81 - 1.00				Ireland (9.737)	

Note: Figures in parenthesis are the percentage growth rates of the average 1999-2002 GDP per capita (purchasing power parity in constant 2000 price).

*Countries with *IFI*<0.1

Due to the unavailability of data, a great number of economies, mainly developing economies, are excluded in the study. The lack of data, especially data on the performance of indigenous, presumably meant that the performance of indigenous factors in the poor developing economies is weak, and if they were included in the sample, they would probably in the lower range of the *OFI* and *IFI*. The lesson is clear that sound performance in the various indigenous factors will facilitate the good performance of external and openness factors, whose improvement can have a positive and cumulative impact on globalization. In short, advancement in the performance of indigenous factors will help promoting openness.

V. Conclusion

This paper studies the globalization debate by making reference to Fischer (2003) who pointed to the importance of non-economic issues in fostering an economy's globalization drive. Recent globalization indices ranked the performance of globalization among different world economies without domestic factors (Anderson and Herbertsson 2005, Kearney 2005 and Dreher 2006). This paper improves on the analysis of these globalization indices by considering both the openness and indigenous factors

In constructing economic openness, this paper takes into account the pattern of trade and industries by incorporating the inter-industry and intra-industry trade, in addition to the total trade flows. The number of indigenous factors used in the analysis should provide a comprehensive picture on the domestic performance in the sample economies. Empirical estimations are conducted on the openness factors indicator and indigenous factor indicator across 62 world economies for the five year period. The significant estimation result that indigenous factors are important in promoting an economy's growth through openness factors has led to further analysis on the relationship between the two types of factors. Given different level of openness factors, a higher performance in the indigenous factors indicators will always produce a higher growth rate. When the performance of an economy's indigenous factors is extremely low, it would be appropriate for that economy to improve its indigenous factors than to engage in globalization. In other words, performance in the indigenous factors is the more fundamental issue than openness. Before the "optimal" level of

indigenous factors performance is reached, the economy will get better off in per capita GDP as the performance of indigenous factors improve.

Literature on the gain from globalization, on the endogenous growth factors and on the economism paradigm of economic development all point to the importance of sound performance in domestic factors. By comparing the 62 world economies in their performance in both the openness and indigenous factors, one comes to the conclusion that sound performance in the indigenous factors is very crucial to economic openness and globalization. All economies with strong performance in economic openness and globalization have sound performance in their indigenous factors.

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