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GDP vs genuine progress quantification of economic performance in South Korea and Malaysia

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Abstract

Malaysia and South Korea, successful graduates of Asian Financial Crisis, employed different paths to recovery via Capital Control and IMF bail-out respectively. This paper tracks recovery trajectories of the two nations via orthodox and emergent growth indicators: GDP and GPI. We report unemployment, open-trade, fixed capital accumulation, and prior crisis to be influential determinants of both metrics, while credit and foreign exchange rate lack significance.

Keywords: GDP; genuine progress; sustainable growth; Malaysia; South Korea
JEL Classification Codes: O44, Q01, Q56, R11

1. Premise

The 1997 Asian Financial Crisis serves as a pivotal point for measuring economic performances of most of its crisis-struck constituents. Within this literature, of particular import are Malaysia and South Korea—having applied dissimilar antidotes. The former adopted independent (capital controls) recovery plans, while Korea adopted the IMF treatment. Post-crisis, both nations are regarded as success stories, having achieved rapid growth, despite taking different routes, as measured by medium-term rates of GDP growth within a decade (Zumkehr & Andriesse, 2008).

The traditional yardstick of quantifying economic growth, GDP—along with its various derivatives like GNP and GNI, faces competition today from a number of alternative metrics. Economists and development experts of various disciplines, ranging as far back as 1960s, objected to multiple limitations of GDP as an economic performance measure. Most notably, sustainability advocates underscore GDP's shortfalls as a general metric for well-being. These concerns have led to the experimentation and development of an eclectic array of indices for policy legislation from the 1970s onwards. Among them, Genuine Progress Indicator (GPI) has been demonstrating a rise in prominence as an alternative performance measure, particularly

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through reproduction at various regional and national levels as listed in Posner & Costanza (2011) and Bleys & Whitby (2015). Despite growing interest, quantification and adoption of GPI is very much in its infancy. Moreover, GPI figures are uncalculated for a great portion of world economies. For Malaysia and South Korea in particular, there are calls from academia and policy levels for development of GPI indices (Othman et al., 2014; Feeny et al., 2013).

GPI is best defined in its general framework based on the work of Talberth et al. (2007). As the metric's parametrization is still a "work in progress," a consensus on GPI's definition is yet not reached. As such, countries applying the GPI measure broadly rely on the precedents set by other bodies and calibrate to suit its unique environment. Hence, a component of GPI for a country might not be the component for another country. Empirical attempts till date mostly use the same personal consumption data as GDP but make additions to account for the services from consumer durables, public infrastructure, volunteering, housework values, deductions to account for income inequality and costs of crime, environmental degradation, and loss of leisure. Its advocates claim that by incorporating the forestated variables this indicator better reflects sustainability performances of an economy.

2. Study design

The study utilizes secondary data, mainly sourced from the World Bank, from 1980 to 2014, for all determinants except for GPI and external debt. A summary of the sources for data (except for GPI) is provided in Table 1.

Table 1. Summary of Data Sources (I).

Code	***Variable***	***Source***	***Details***	***Freq***	***Period available***
GDP	Gross Domestic Product	World Bank	GDP at purchaser's prices (current US$).	Annual	1980-2014
DEBT	External Debt	Collins and Park (1989), OECD External Debt Statistics (EDS; various editions), Sheng (2009), Bank of Korea, World Bank	All data are in current U.S. dollars. Data for Malaysian external debt are from the World Bank website, as for South Korea there are limitations due to obtaining from a single source, thus, this study employs combination of sources.	Annual	1980-2014
OPEN	Trade Openness	World Bank	Ratio of the value of trade (value of imports plus value of exports) to GDP.	Annual	1980-2014
FC	Fixed Capital	World Bank	Includes land improvements – such as boundary markers, channels, drains, etc. – purchase of plant, machinery, and equipment, and the construction of roads, railways, together with schools, offices, hospitals, private residential dwellings, and commercial and industrial builds. All data are in current U.S. dollars.	Annual	1980-2014
UNEMP	Unmployment Rate	IMF IFS and DOS Malaysia	For the years that are unavailable, data are interpolated.	Annual	KOR: 1980-2014; MYS: 1982-2014
INF	Inflation	World Bank	Measured by the consumer price index in the current U.S. dollar.	Annual	1980-2014
CREDIT	Domestic Credit provided by the financial sector	World Bank	Includes all gross claims to various segments except to the central government, which is in net amount, derived as percentage of GDP.	Annual	1980-2014

FDI	Foreign Direct Investment	World Bank	Net inflows of foreign direct investment are used to represent financial openness. All data are in current U.S. dollars.	Annual	1980-2014
EXC	Exchange Rate	World Bank	The exchange rate established by national authorities and defined as the price of one currency in terms of another.	Annual	1980-2015
I	Interest Rate	World Bank	Deposit interest rate is used to represent many interest rates coexisting in an economy and these rates differ by country.	Annual	1980-2014
CRID	Financial Crisis Dummy		Follow Reinhart & Rogoff, (2011; 2014), and Tamirisa et al. (2007) to represent the 1997 Asian financial crisis. "1" is assigned to the years of crisis and "0" is assigned to the years without crisis.	Annual	1980-2014
COND	Capital Control Dummy		Follow Doraisami (2004) and Inoguchi (2009). "1" is for Malaysia (implemented control) and "0" is for South Korea (adopt IMF aid).	Annual	1980-2014
PRED	Previous Crisis Dummy	Findings of Reinhart & Rogoff (2014)	Ouyang & Rajan (2014) mention that, economies without previous banking or debt crises tend to accumulate a higher degree of external debt without negatively affecting growth. "1" is assigned to the years of crisis and "0" is assigned to the years without crisis.	Annual	1980-2014

The initial step in performing the analysis for this study is to construct a GPI for South Korea and Malaysia. We accomplish this by invoking the following equation:

$$GPI_{it} = CON_{it} + HL_t + SCD_{it} + SHS_{it} - CC_{it} - CD_{it} - AIR_{it} - NAT_{it} - FD_{it} + CI_{it} \quad (1)$$

Here, for country *i* and time *t*,

- GPI_{it} = Genuine Progress Indicator;
- CON_{it} = Weighted Personal Consumption;
- HL_{it} = Household labour;
- SCD_{it} = Service from consumer durables;
- SHS_{it} = Service from highways and streets;
- CC_{it} = Cost of crime;
- CD_{it} = Consumer Durables;
- AIR_{it} = Cost of air pollution;
- NAT_{it} = Natural resources depletion;
- FD_{it} = Change in foreign debt;
- CI_{it} = Change in net capital investment

The employed variables and methodology rely on seminal works by Talberth & Bohara (2006) and Tran (2011). For brevity, detailed GPI calculations are furnished in supplementary appendices. Components of the GPI, data sources and how they are calculated are in accordance with Table 2.

Next, we analyse the data in a double-log equation as formulated in equation (2) below:

$$\ln Y_{it} = \beta_0 + \beta_1 \ln DEBT_{it} + \beta_2 \ln OPEN_{it} + \beta_3 \ln PFC_{it} + \beta_4 \ln UNEMP_{it} + \beta_5 CRID_{it} + \beta_6 COND_{it} + \beta_7 PRED_{it} + u_{it} \quad (2)$$

Here, for country *i* and time *t* (to simplify, natural logs are dropped),

- Y_{it} = GDP / GPI;
- $DEBT_{it}$ = External debt;

- $OPEN_{it}$ = Trade openness;
- PFC_{it} = Fixed capital;
- $UNEMP_{it}$ = Unemployment rate;
- $CRID_{it}$ = Crisis dummy;
- $COND_{it}$ = Capital controls dummy;
- $PRED_{it}$ = Previous crisis dummy;
- u_{it} = error term;

The model in equation (1) extends on works by Othman et al. (2014) and Talberth & Bohara (2006), who both utilize the Solow Growth Model, which proposes that GDP is a function of the nation's stocks of capital (K) and labour (L) as well as other determinants (O) and can be formulated as $GDPt = f(K_t, L_t, O_t)$. As such, extending the experimentation of Talberth and Bohara (2006), we test additionally for Ot factors such as financial liberalization (proxied via FDI), exchange rate stability (REER), and inflation. We apply customary econometric tests (Breusch-Pagan LM, Im-Pesaran-Shin Unit Root, and other Diagnostics) commensurate with standard panel data analysis.

Table 2. Summary of Data Sources (II).

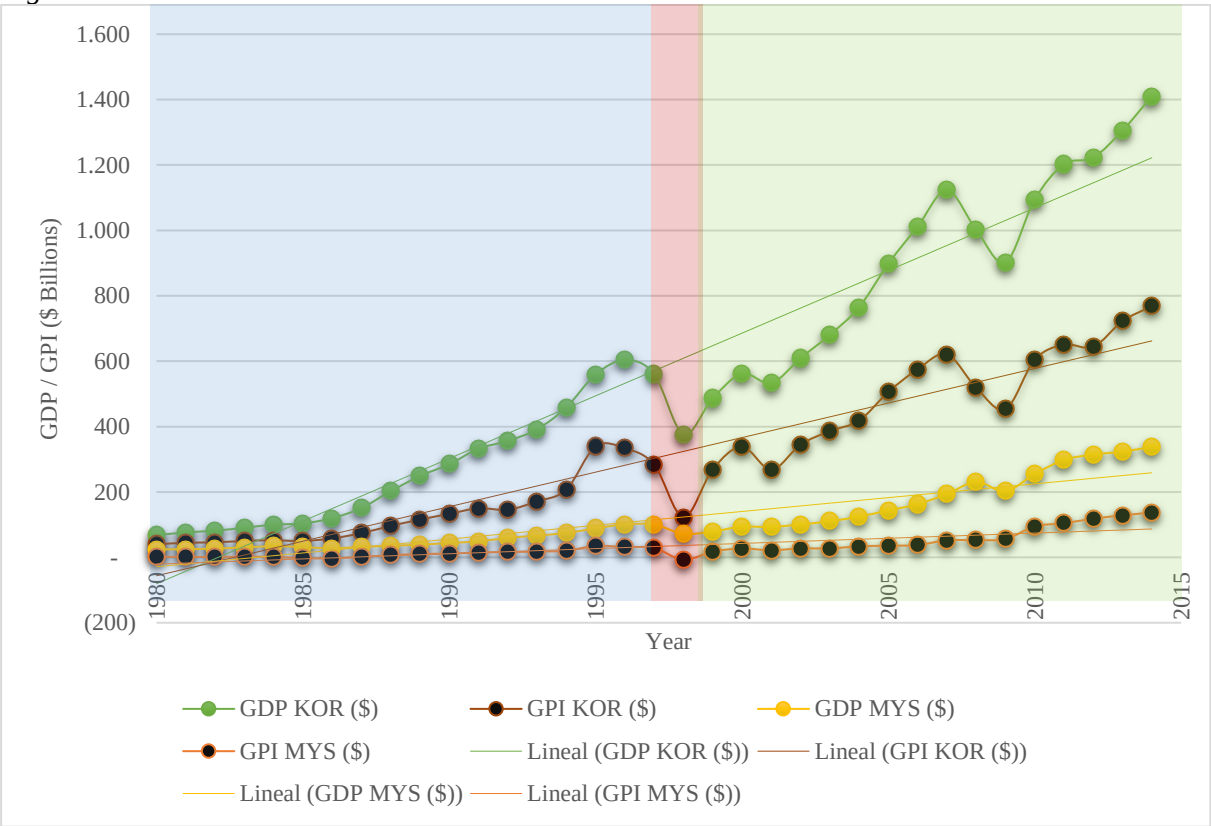
Code	***Variable***	***Source***	***Details***	***Freq***	***Period available***
HCON ($bill)	Household final consumption expenditure (billions of US$)	World Bank	Household final consumption expenditure (current US$)	Annual	1980-2014
DI	Distribution Index	KOR: Kang (2001) MYS: Official Website of Economic Planning Unit - Household Income & Poverty	Lowest Gini coefficient is set as base (2014) and index is calculated by finding difference between current year and base year figure. Unavailable input follows the preceding year input	Annual	KOR: 1980-2000, 2006-2014MYS: 1979, 1984, 1987, 1989, 1992, 1995, 1997, 1999, 2002, 2007, 2009, 2012, 2014
+ CON ($bill)	Weighted Personal Consumption (billions of US$)	NIL	HCON ($bill) divided by DI	Annual	1980-2014
+ HL ($bill)	Household labor (billions of US$)		Multiplication of WH, MW and NH	Annual	KOR: 1988-2014; MYS: 2012-2014
WH	Annual Working Hours	NIL	Total weeks per year minus VW, assuming 52 weeks per year.	Annual	1980-2014
VW	Vacation Weeks	Justlanded.com website	Number of vacation weeks per year.	Annual	1980-2014
MW	Minimum Wage	KOR: Minimum Wage Council Republic of Korea, ECOS Economic Statistics System, Bank of Korea; MYS: Minimum Wages Malaysia	Hourly minimum wage. Unavailable data is estimated at average ratio of available minimum wage to GDP per capita (South Korea: 24.14% and Malaysia: 26.40%).	Annual	KOR: 1988-2014; MYS: 2012-2014
NH	Number of Households	World Bank	Population divided average person per household.	Annual	1980-2014

+ SCD ($bill)	Service from consumer durables (billions of US$)	KOR: ECOS Economic Statistics System, Bank of Korea; MYS: UNdata Report Database	Following Tran(2011), inputs are derived from adding previous ten years of consumer durables to arrive at stock of consumer durables, then multiplying by 0.1 (10%). Stock of consumer durables for 1980 until 1989 is computed by discounting at average 10 years ratio of the stocks to household final consumption expenditure of following years (KOR: 6%, MYS: 15%)	Annual	KOR: 1980-2014; MYS: 1983, 2000-2013
+ SHS ($bill)	Service from highways and streets (billions of US$)	World Bank	Adjusted savings: consumption of fixed capital (current US$)' times the total of 'Deposit interest rate (%)' and depreciation rate. Depreciation is assumed at 7.5% (Talberth (2007).	Annual	1980-2014
- CC ($bill)	Cost of crime (billions of US$)	United Nations Crime Trends Surveys (United Nations Office on Drugs and Crime Database - UNODC), Korean National Police Agency (KNPA), Amin (2014), Keng (2005)	Number of recorded offences times costs of crime.	Annual	1980-2000, KOR: 2005-2014, MYS: 2004, 2007 – 2013
- CD ($bill)	Consumer Durables (billions of US$)	KOR: ECOS Economic Statistics System, Bank of Korea; MYS: UNdata Report Database	For Malaysia, only 'Furnishings, household equipment and routine maintenance of the house' assumed as durables.	Annual	KOR: 1980-2014; MYS: 1983, 2000-2013
- AIR ($bill)	Cost of air pollution (billions of US$)	The Cost of Air Pollution - Health Impacts of Road Transport (OECD)	Unavailable data being estimated at annual growth rate 0.25% and the cost is as percentage of total of final household consumption.	Annual	KOR: 2005, 2010
- NAT ($bill)	Natural resources depletion (billions of US$)	World Bank	Adjusted savings: natural resources depletion (% of GNI)' times 'GNI (current US$)'.	Annual	1980-2014
- FD ($bill)	Change in foreign debt position (billions of US$)	Collins and Park (1989), OECD External Debt Statistics (EDS; various editions), Sheng (2009), Bank of Korea, World Bank	Difference between External debt previous year and current year.	Annual	1980-2014
+CI ($bill)	Change in net capital investment (billions of US$)	World Bank	Amount of new capital (change in 'gross fixed capital formation' from previous year) minus capital requirement. capital requirement = changes in labour force participation rate times previous year's gross fixed capital formation.	Annual	1980-2014

3. Results

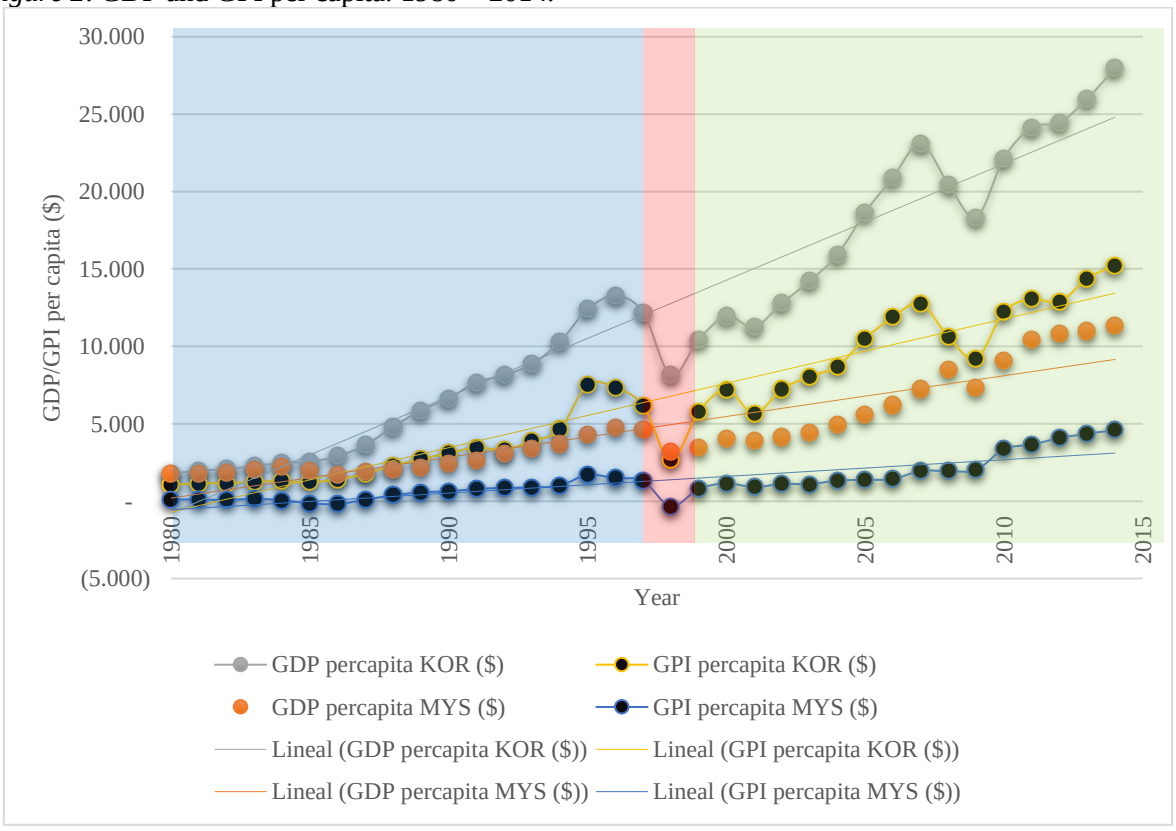
Comparing the calculated GPI results for Malaysia and South Korea, we arrive at the following GDP-GPI curves. This conforms to most findings in the literature; the performance when measured by GPI is not as high as the one that GDP portrays.

Figure 1. GDP and GPI: 1980 – 2014.



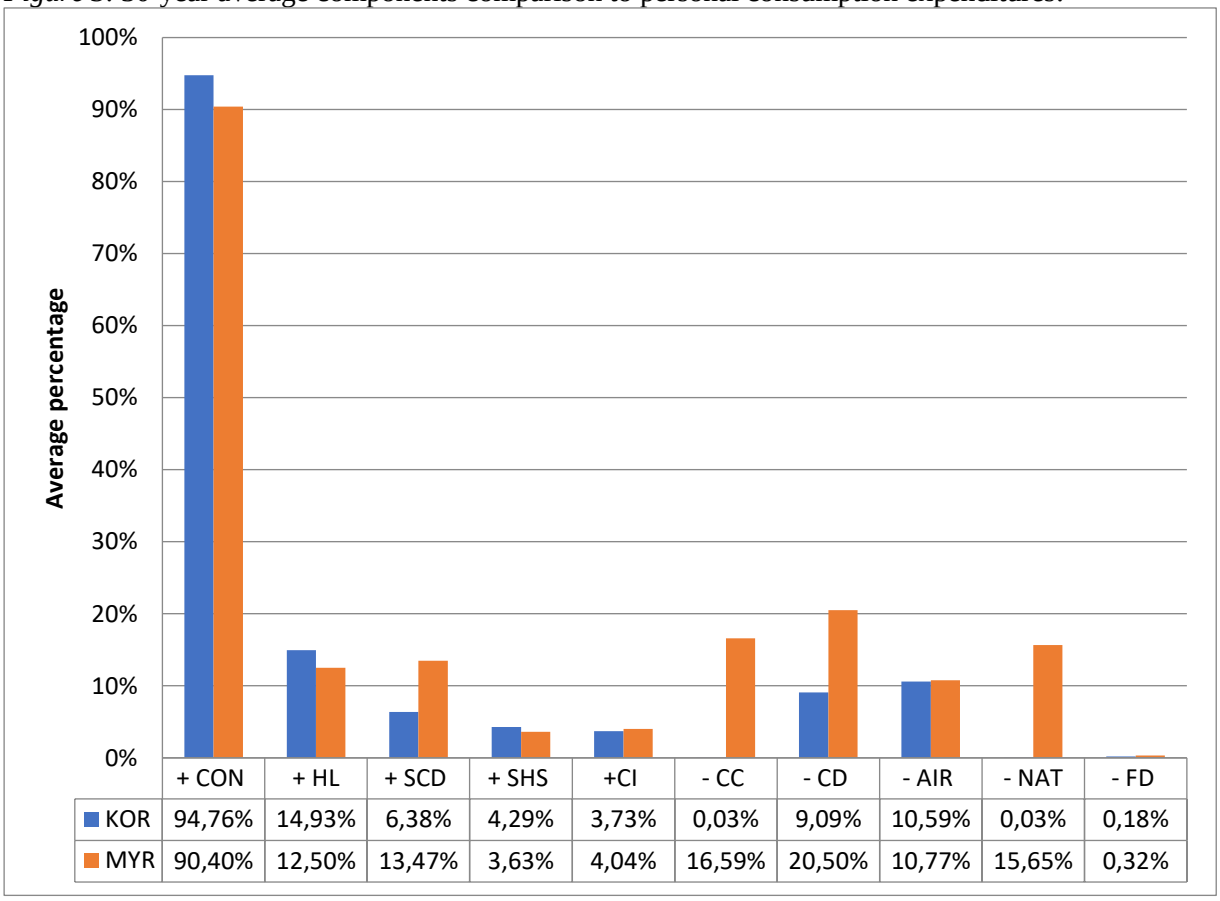
Note. Pre-crisis, crisis, and post-crisis periods are panellised in blue, red, and green shades.

Figure 2. GDP and GPI per capita: 1980 – 2014.



Note. Pre-crisis, crisis, and post-crisis periods are panellised in blue, red, and green shades.

Figure 3. 30-year average components comparison to personal consumption expenditures.



	+ CON	+ HL	+ SCD	+ SHS	+CI	- CC	- CD	- AIR	- NAT	- FD
KOR	94,76%	14,93%	6,38%	4,29%	3,73%	0,03%	9,09%	10,59%	0,03%	0,18%
MYR	90,40%	12,50%	13,47%	3,63%	4,04%	16,59%	20,50%	10,77%	15,65%	0,32%

The divergence between the two indicators varies minimally between 1980 and 1986. Alarmingly, beyond 1986, per capita GPI fails to appreciate vis-a-vis per capita GDP. Besides, although both indicators grow positively, the difference in indicator growth exhibits a wedge between the two beyond 1986. South Korea's GDP and GPI per capita recede in 1998 and rise again after the Asian crisis. Both measures drop slightly in 2001 and continue to increase until 2007, yet maintaining the same gap. Around the subprime mortgage crisis, GPI per capita drops earlier in 2008 than the GDP per capita in 2009. Interestingly beyond 1986, the growth rate of both countries' GPI fails to match the pace in increase of respective per capita GDP. From this we surmise: firstly, the rise in GDP per capita underpins escalating social and environmental costs. Secondly, the speedy rise in per capita GDP overall does not translate to equivalency in sustainable welfare. The volatility and patterns in per capita GPI are inferior compared to rate of economic growth during the study time and can be explained by deconstructing the GPI compositions. On average, each component contributes to GPI differently. Compared to the personal consumption expenditures, almost 124% are additions from CON (92%), HL (14%), SCD (9%), SHS (4%), and CI (4%) for both countries. However, deductions from MYS are greater than KOR approximately by 44%; particularly on CC, CD and NAT by 17%, 11% and 16% respectively. 30-year average components comparison to personal consumption expenditures for both countries is presented in Figure 3. The estimation results of panel data for all indicators, using OLS, Panel-Random, and Panel-Fixed effects, as well as three additional models are presented in Table 3.

The tables above demonstrate that changes in debt and unemployment are important determinants of GDP. Moreover, a direct and indirect relationship are observed between GDP against debt and unemployment respectively. Other influential determinants are trade openness, fixed capital level, trade openness, foreign direct investment, exchange rate, interest rates, and

incidence of prior crisis. Financial crises and capital controls remain inconsequential. Tests with GPI as DV suggest debt and unemployment to be significant with 90% confidence per the fixed effects model Furthermore, debt and trade openness exhibit positive positive effect on GPI, while unemployment does the opposite. The largest magnitude increases on GPI at 1.025% per 1% rise comes from debt. All dummy variables show no significance. We summarize the results as follows (see Table 4).

Table 3. Panel data analysis with GDP (Panel A) and GPI (Panel B) as dependent variable; (1) Base model, (2) Fixed effects model, (3) Random effects model, (4) Robustness test 1, (5) Robustness test 2, and (6) Robustness test 3.

GDP (Panel A)	***(1)***	***(2)***	***(3)***	***(4)***	***(5)***	***(6)***
VARIABLES	***lgdp***	***lgdp***	***lgdp***	***lgdp***	***lgdp***	***lgdp***
Ldebt	1.027***	0.947***	1.027***	1.000***	0.734***	0.936***
	(0.0365)	(0.0479)	(0.0365)	(0.0572)	(0.0527)	(0.0481)
Lopen	-0.496***	-0.129	-0.496***	-0.570***	-0.197	-0.719***
	(0.0709)	(0.164)	(0.0709)	(0.137)	(0.126)	(0.106)
Lpfc	0.537***	0.480**	0.537***	0.393	0.0836	0.749***
	(0.199)	(0.193)	(0.199)	(0.247)	(0.170)	(0.204)
Lunemp	-0.350***	-0.365***	-0.350***	-0.397**	-0.428***	-0.399***
	(0.128)	(0.123)	(0.128)	(0.155)	(0.0992)	(0.123)
Lcpi				0.0528		
				(0.0556)		
Lcr				0.131		
				(0.155)		
Crid	-0.115	-0.106	-0.115	-0.0619	-0.165	0.0678
	(0.138)	(0.133)	(0.138)	(0.152)	(0.107)	(0.147)
Cond	0.100	-0.00969	0.100	-0.0153	-0.0273	0.104
	(0.242)	(0.237)	(0.242)	(0.269)	(0.190)	(0.230)
Pred	-0.402**	-0.380**	-0.402**	-0.342*	-0.226	-0.369**
	(0.188)	(0.181)	(0.188)	(0.200)	(0.147)	(0.179)
Lfdi					0.141***	
					(0.0249)	
Lexc					0.118***	
					(0.0246)	
Li						-0.324***
						(0.118)
Constant	1.294	1.802	1.294	2.215	5.342***	4.493**
	(1.541)	(1.497)	(1.541)	(2.134)	(1.349)	(1.874)
Breusch-Pagan LM Test		1.0000 (0.0000)				
Hausman Test			6.08			
			(0.5303)			
Wooldridge	32.525			94.051	52.996	27.299
	(0.1105)			(0.0654)	(0.0869)	(0.1204)
Breusch-Pagan / Cook-Weisberg	6.08			5.89	27.47	6.03
	(0.5301)			(0.7506)	(0.0012)	(0.6444)
Observations	70	70	70	70	70	70
R-squared	0.959	0.931	0.958	0.959	0.976	0.963

Table 3 (cont). Panel data analysis with GDP (Panel A) and GPI (Panel B) as dependent variable; (1) Base model, (2) Fixed effects model, (3) Random effects model, (4) Robustness test 1, (5) Robustness test 2, and (6) Robustness test 3.

GPI (Panel B)	***(1)***	***(2)***	***(3)***	***(4)***	***(5)***	***(6)***
VARIABLES	***lgpi***	***lgpi***	***lgpi***	***lgpi***	***lgpi***	***lgpi***
ldebt	1.380***	1.025***	1.380***	1.598***	0.859***	1.407***
	(0.0854)	(0.100)	(0.0854)	(0.132)	(0.134)	(0.121)
lopen	-0.916***	0.692*	-0.916***	-0.344	0.574*	-0.848***
	(0.167)	(0.347)	(0.167)	(0.315)	(0.325)	(0.268)
lpfc	0.603	0.314	0.603	1.052*	0.121	0.543
	(0.468)	(0.398)	(0.468)	(0.562)	(0.428)	(0.507)
lunemp	-0.756**	-0.927***	-0.756**	-0.368	-1.012***	-0.737**
	(0.310)	(0.263)	(0.310)	(0.354)	(0.260)	(0.318)
lcpi				0.0567		
				(0.131)		
lcr				-0.659*		
				(0.354)		
crid	-0.116	-0.0513	-0.116	-0.350	-0.120	-0.173
	(0.323)	(0.272)	(0.323)	(0.343)	(0.267)	(0.369)
cond	0.337	-0.229	0.337	0.704	-0.294	0.365
	(0.713)	(0.610)	(0.713)	(0.738)	(0.598)	(0.724)
pred	0.173	-0.147	0.173	0.0533	0.0205	0.176
	(0.610)	(0.516)	(0.610)	(0.602)	(0.516)	(0.615)
lfdi					0.0886	
					(0.0631)	
lexc					0.352***	
					(0.0642)	
li						0.0976
						(0.301)
Constant	-6.370*	-3.761	-6.370*	-13.55***	-1.652	-7.359
	(3.617)	(3.082)	(3.617)	(4.886)	(3.392)	(4.752)
Breusch-Pagan LM		1.0000				
Test		(0.0000)				
Hausman Test			26.90			
			(0.0003) ***			
Wooldridge	39.480			33.266	9.493	108.441
	(0.1005)			(0.1093)	(0.1998)	(0.0609)
Breusch-Pagan /	36.97			43.12	40.93	36.60
Cook-Weisberg	(0.0000)			(0.0000)	(0.0000)	(0.0000)
Observations	67	67	67	67	67	67
R-squared	0.893	0.848	0.898	0.902	0.930	0.893

4. Conclusion

In this paper, we construct GPI for South Korea and Malaysia from 1980 to 2014. Notwithstanding a few omissions in GPI components owing to data unavailability, we find GPI curves to be lower than their GDP counterparts. Our panel estimations reveal that external debt has a direct relationship to both GDP and GPI in the long term. However, capital controls are insignificant to both GDP and GPI measures. The results also suggest that unemployment rate, trade openness, fixed capital formation and history of previous crises are influential drivers of GDP and GPI. Credit and exchange rates, however, show inconsistent effects in GDP and GPI. Further explanation is by answering the three following questions.

First: What are the determinants/variables that contribute to GPI? The determinants of GPI are different from GDP even though both begin from personal consumption. Several adjustments are made to GPI to reflect the sustainability element of the country's performance. These adjustments are not subject to a specific standard framework to be applied to all countries.

For instance, consumer durables data for South Korea is available but not for Malaysia. Future researchers may exclude the variable or include it with a certain level of assumptions involved. However, for comparison purposes, we include the variable and make assumptions to ease the process—consistent with prior empirical praxis.

Even though variables included in computation of GPI are different from GDP, they unfurl crucial information uncaptured by GDP; e.g.: value of household works, costs of crimes, costs of natural resource depletions, and distribution index. These variables show different trends not parallel to the personal consumption trend. Comparing regressions for GDP and GPI together for explanation, we acknowledge the potency of each index in providing different points of view in defining growth: GDP as a comparable economic growth measure between nations due to standardized and worldwide usage, with GPI as a measure for sustainability performance.

The second and third questions will be explained together. Second: Does the use of external debt for crisis recovery boost a country's long-term growth (GDP and GPI)? Third: Does imposing capital controls for crisis recovery boost a country's long-term growth (GDP and GPI)? Regression outcomes suggest that external debt implementation contributes significantly to growth as indicated by both measures. In addition, the magnitude of debt-growth consistently shows higher positive values compared to other independent variables in all tests. Contrarily, capital controls dummy is insignificant regarding effect on growth of both GDP and GPI. Therefore, over a 35-year long window, external debt contributes positively to growth performance measured by either approach. Per contra, capital control imposition does not contribute to growth—in both approaches.

Lastly, we acknowledge inadequacy of evidence to draw conclusions about the contributions of these two policies in the short run. Given that there is literature that supports a temporary effect of capital controls on growth, the role of capital control in the short run cannot be ignored. These findings should enable policymakers to chart a different strategy for handling future crises from economic, well-being and sustainable viewpoints. This rings especially true for the emerging and crisis-prone economies, magnified further by percolation of interdependence and contagion in global economic climate.

Table 4. Consolidated findings.

			GDP		***GPI***	
Variables		***Hypothesis***	***Significance***	***Relationship***	***Significance***	***Relationship***
ldebt	External debt	+/-	YES	+	YES	+
lopen	Trade openness	+/-	YES	-	YES	+/-
lpfc	Fixed capital	+	YES	+	YES	+
lunemp	Unemployment rate	-	YES	-	YES	-
lcpi	Inflation	+/-	NO	+	NO	+
lcr	Credit	+	NO	+	YES	-
crid	Asian crisis dummy	-	NO	-	NO	-
cond	Capital controls dummy	+	NO	+/-	NO	+/-
pred	Previous crisis dummy	-	YES	-	NO	-
lfdi	Foreign direct investment	+	YES	+	NO	+
lexc	Exchange rate		YES	+	YES	+
li	Interest rate	-	YES	-	NO	+

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