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Environmental Performance Index and GDP growth rate: evidence from BRICS countries

Abstract

BRICS countries have experienced rapid economic growth and played a vital role in the world economy because of their capacity to produce large number of manufacturing products, supplies of raw materials, natural resources and the advantage of geographical locations and demographic attributes. Extremely speedy industrialization process has been acting as one of the key driving forces for rapid economic growth. According to the IAEA, coal use in India and China will more than double by 2050. To achieve high economic growth, these countries are facing severe environmental problem. India and China were the top two nations with largest total ecological footprints in 2003. Research question of the study is whether relationship between Environmental Performance Index and GDP growth rate in BRICS countries prevails? The study used secondary sources. The study used a sample of five emerging developing countries (BRICS) namely Brazil, Russia, India, China and South Africa. This study examined Environmental Performance Index (EPI) and GDP trends. Based on the collected data covering the period from 2002 to 2016, the analysis indicates that there is a negative relationship between GDP growth rate and Environmental Performance index. However, the study observed that strong correlation between EPI and GDP growth rate except Russia did not prevail. National accounting procedure should include environmental impact which needs to be addressed by the policy makers as suggested by authors.

Keywords: Environmental Performance Index (EPI), GDP, environment and growth, trade and environment, environmental accounting, sustainability, BRICS.

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Introduction

BRICS stands for an association of five major emerging countries, which includes Brazil, Russia, India, China and South Africa. The world climate is changing and the Earth is warming up. Many experts argue that human is greatly responsible for this change. Burning fossil fuels, cutting down rainforest and farming livestock contribute to increase of greenhouse gas emissions. Human economy and natural world are closely connected with each other. Without an untouched natural environment, no development can be sustained. EPI explains how different production activities and business activities, such as emission, waste generation and resource consumption, affect on the natural environment. According to Lober (1996), to protect and preserve the natural environment, organizations commit through its several dimensions or aspects such as maintaining the quality of water, air, soil, etc. The main reason

behind preparing EPI is to reduce the environmental stresses on human health, the loss or degradation of ecosystems and natural resources. The Environmental Performance Index is a composite index developed by Yale University's Environment School and The Earth Institute at Columbia University in collaboration with World Economic Forum and Joint Research Centre of the European Commission. Moreover, economic expansion in the BRICS cluster – Brazil, Russia, India, China and South Africa – has been, potentially with the exception of Brazil, fuelled by policies which traded off environmental objectives in favor of economic expansion. After over two decades of growth, this trade-off is increasingly coming under the spotlight; China continues to be the largest GHG emitter globally, and both India and the Russian Federation are within the top 10 global emitters (The Global Energy Architecture Performance Index Report, 2014).

According to Tedino (2017), the relationship between economic development and environmental quality has become important to economic and environmental policy making for sustainable growth. Governments in developing economies are incentivized to lower environmental standards in order to attract foreign investment and capital, which leads to the divergence of international environmental conditions. Brazil, Russia, India, China and South Africa are collectively known as BRICS. The acronym BRIC was first used in 2001 by economist Jim O'Neill, of Goldman Sachs, in a report on growth prospects for the economies of

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Brazil, Russia, India and China. BRICS countries have large populations, wide territory and huge natural resources. By the rising share of GDP, as well as trade, BRICS countries have become more and more consolidate into the world economy. Trade liberalization has positive effects on GDP. It stimulates investment and innovation. BRICS countries have 43% of world population, 30% of the world GDP and 17% share in the world trade. Their economy is growing so fast and to maintain this fastest growth rate they are using significant landmass, natural resources and considerable amounts and diversity of energy and technology advances. Among the BRICS members, China's economy is growing fast and South Africa has slower economic growth. India has the lowest per capita GDP of \$5238. In 2014, India's share of export of goods and services in GDP was 23.2%, while Russia and South Africa's share were 30% and 31.3%, respectively. So unquestionably they are responsible for a substantial amount of global emission. Reducing Carbon emissions without hunting economic growth is the main challenge to the BRICS members. To achieve sustainable growth and development, they should follow the environmentally friendly development path which generates low carbon in all respects of their production and consumption. The main objective of this study is to investigate the relationship between EPI score and GDP growth rate in BRICS countries. The study selected BRICS group because of its economic status and global influence. Research question of the study is whether the relationship between Environmental Performance Index and GDP growth rate in BRICS countries prevails? As such, objectives of the study have been framed as follows:

- ◆ to identify relationship between Environmental Performance Index and GDP growth rate among BRICS countries;
- ◆ to draw some implications from the study.

1. Literature review

Frankel and Rose (2005) argued that trade tends to reduce three measures of air pollution. They observed that significance is high for concentrations of SO₂, moderate for NO₂, and lacking for particulate matter. Even though consequences for other environmental procedures are not as hopeful, there is small confirmation that trade has a negative impact on the environment.

Cracolici et al. (2009) described that inability of most countries to turn the higher educational skills of the population into greater economic performance over time. They also found that making an accurate

picture record and formulating related policy aiming at environmental care is highly desirable. It is surprising that only a few countries have reached a favorable economic and environmental performance simultaneously.

Samimi et al. (2011) evaluated the relationship between Environmental Sustainability Index and economic growth in developing countries. The study found an inverted-U shape curve regarding the relationship between environmental sustainability and economic growth.

Alam et al. (2013) investigated the relationship between economic growth and environmental performance empirically in the context of East and South-East Asian countries. By employing both general analysis and empirical model, it is found that the increase of the GDP per capita appears to have a positive impact on the pollution measures.

Alvarez et al. (2014) depicted that socioeconomic factors, such as economic wealth and education, as well as institutional factors represented by the style of public administration, in particular control of corruption and determinant causes of environmental performance, were observed. Duasa et al. (2013) found that economic development positively contributes to the countries' environmental performance. On the other hand, population size has a negative impact on the environmental performance of the countries. Arfanuzzaman (2016) observed that there is a cointegrating relationship between CO₂ emission, per capita income, HDI and EPI in Bangladesh.

Environmental issues must add another major criticism of standard accounting measures as they fail to account for environmental degradation and resource depletion. This issue can be important especially in developing countries, which depend heavily on natural resources. If a country cuts down its forests, depletes its soil fertility, and pollutes its water supplies, this surely makes the country poorer in some very real sense. But national income accounts merely record the market value of the timber, agricultural products, and industrial output as positive contributions to GDP (Harris & Roach, 2016).

Tamim et al. (2016) examined the relationship between economic growth and environmental performance in South Asian countries, namely Bangladesh, India, Nepal, Sri Lanka and Pakistan. To estimate the relationship, the study used least square dummy variable model (LSDV). The study finds that increase of GDP growth rate appears to have a positive impact on the EPI measures.

Fakher et. al. (2017) examined the impact of Environmental Performance Index, foreign direct investment and trade liberalization on economic growth of selected developing countries were reviewed throughout 1983–2013. The panel unit root tests, the bounds test (ARDL), and the diagnostic tests were employed in the present study. The results indicated a positive and significant impact of the Environmental Performance Index on economic growth. Islam, Ali, and Medhekar (2017) suggested that government should provide incentives to set up community banking in the rural areas including informal sector, micro savings, and investment through green financing, for green production, green transportation and green consumption. Lee and Thiel (2017) found that as GDP growth rate increases, the EPI score neither increases nor decreases.

From the literature review, it was revealed that the relationship between Environmental Performance Index and GDP growth rate in BRICS countries was not earlier discussed; effort has been made to highlight the concerns of BRICS countries' relationship between the Environmental Performance Index and GDP growth rate. Few studies which depicted an overview of the developing countries' relationship between the Environmental Performance Index, environmental

sustainability and GDP growth rate. As such, we have undertaken the present study.

2. Research methodology

The study is based on secondary data sources. The data obtained for this study has been analyzed by using descriptive statistics. To fulfill the objective, i.e., to examine the relationship between EPI score and GDP growth rate, usual descriptive statistical techniques, i.e., table and graphical presentation, etc., has been used in this study. Data were collected covering the period of 2008 to 2016 (5 years). All observations were annual. Data on GDP have been extracted from World Bank sites and EPI data from Yale Center for Environmental Law and Policy. The study will use EPI, a composite index developed by Yale University, to measure the environmental sustainability (Yale Center for Environmental Law and Policy, 2008; Samimi et al., 2011). The study will determine the correlation between EPI score and GDP growth rate of respective country.

3. Present status and findings

The study now describes the relationship between EPI score and GDP growth rate from 2008 to 2016 with two years interval for BRICS countries in Table 1.

Table 1. Relation between EPI score and GDP growth rate

Year	Country	EPI score	GDP growth rate, %	Average EPI score	Average GDP growth rate
2008	Brazil	82.7	5.1	72.2	5.42
	India	60.3	3.9		
	China	65.1	9.7		
	Russia	83.9	5.2		
	South Africa	69	3.2		
2010	Brazil	63.4	7.5	54.54	7.18
	India	48.3	10.3		
	China	49	10.6		
	Russia	61.2	4.5		
	South Africa	50.8	3.0		
2012	Brazil	60.9	0.5	43.87	3.46
	India	36.23	7.2		
	China	42.24	7.3		
	Russia	45.43	0.7		
	South Africa	34.55	1.6		
2014	Brazil	52.97	0.5	46.832	3.54
	India	31.23	7.5		
	China	43	7.3		
	Russia	53.45	0.7		
	South Africa	53.51	1.7		
2016	Brazil	78.90	- 3.6	70.324	2.06
	India	53.58	7.1		
	China	65.10	6.7		
	Russia	83.52	- 0.2		
	South Africa	70.52	0.3		

Source: based on data retrieved from World Bank and Yale Center for Environmental Law and Policy (Column 5 and 6 were determined by the authors).

From the Table 1, we have seen that in 2008, highest EPI score countries are Russia and Brazil.

Their EPI scores are 83.9 and 82.7 and their GDP growth rates are 5.2 and 5.1, respectively. China's

EPI score is 65.1 and its GDP growth rate is 9.7. In 2010, 2012 and 2014, India's and China's EPI scores are 43.8, 36.23, 31.23, 49, 42.25 and 43 and their GDP growth rates are 10.3, 7.2, 7.5, 10.6, 7.3, and 7.3, respectively. This means that there is a negative relationship between EPI score and GDP growth rate. But in the case of Brazil and Russia, this relationship is positive. In 2010, 2012 and 2014, Brazil's and Russia's EPI scores are 63.4, 60.9, 52.97, 61.2, 45.43 and 53.45 and their GDP growth rates are 7.5, 0.5, 0.5, 4.5, 0.7 and 0.7 percent, respectively. But after 2014, the situation is going to

different. In 2016, China's EPI score is 65.10 and its GDP growth rate is 6.7 percent. This may be that China has concentrated on environmentally friendly growth process. But in case of India, the situation is as usual. In 2016, India's EPI score is 53.58 and its GDP growth rate is 7.1 percent. So negative relationship exists between EPI score and GDP growth rate, which means the higher the GDP growth rate, the lower the EPI score.

Now the study will illustrate the relationship between EPI score and GDP growth rate in Figure 1 for BRICS countries.

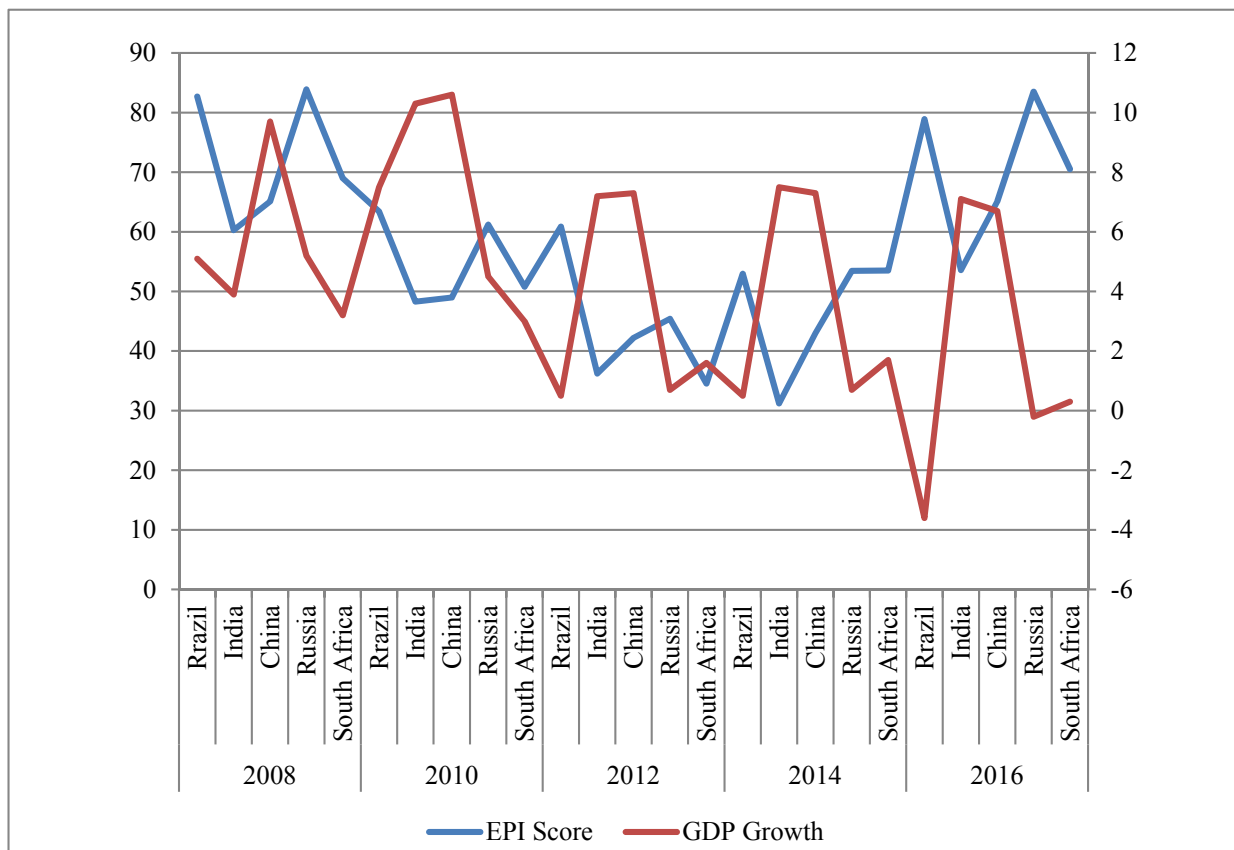


Fig. 1. Relation between EPI score and GDP growth rate

Source: World Bank and Yale Center for Environmental Law and Policy.

From the Figure 1 above, it can be seen that there is a close relationship between Environmental Performance Index and GDP growth rate in the BRICS countries. In 2008, BRICS countries average score of EPI is 72.2 and average GDP growth rate is 5.42 percent whereas the developing countries average EPI score is 69.6 percent (Samini et al., 2010). In 2010, 2012 and 2014, BRICS countries, average score of EPI is 54.54, 43.87 and 46.83 and average GDP growth rate is 7.18, 3.46 and 3.54 percent, respectively. In 2016, BRICS countries average score of EPI is 70.32 and the average GDP

growth rate is 2.06 percent. These scores indicate that the performance levels are not satisfactory, but it is better than the average score of the previous year. Among the BRICS countries, Brazil achieved relatively high performance in EPI and China's performance level in EPI is not so satisfactory.

Now the study has seen a correlation between EPI score and GDP growth rate of respective country in Table 2. Only correlation is significant at the 0.05 level in case of Russia.

Table 2. Correlations

		Brazil GDP	Brazil EPI
Brazil GDP	Pearson correlation	1	-.035
	Sig. (2-tailed)		.956
	N	5	5
Brazil EPI	Pearson correlation	-.035	1
	Sig. (2-tailed)	.956	
	N	5	5
		IndiaGDP	IndiaEPI
India GDP	Pearson correlation	1	-.367
	Sig. (2-tailed)		.544
	N	5	5
India EPI	Pearson correlation	-.367	1
	Sig. (2-tailed)	.544	
	N	5	5
		ChinaGDP	ChinaEPI
China GDP	Pearson correlation	1	.116
	Sig. (2-tailed)		.852
	N	5	5
China EPI	Pearson correlation	.116	1
	Sig. (2-tailed)	.852	
	N	5	5
		RussiaGDP	RussiaEPI
Russia GDP	Pearson correlation	1	.912*
	Sig. (2-tailed)		.031
	N	5	5
Russia EPI	Pearson correlation	.912*	1
	Sig. (2-tailed)	.031	
	N	5	5
		SAEPI	SAGDP
SAEPI	Pearson correlation	1	-.072
	Sig. (2-tailed)		.908
	N	5	5
SAGDP	Pearson correlation	-.072	1
	Sig. (2-tailed)	.908	
	N	5	5

Note: * Correlation is significant at the 0.05 level (2-tailed) in case of Russia only.

Source: computed by authors.

From Table 2, we observed that strong correlation between EPI and GDP growth rate except Russia did not prevail.

Conclusion and implications

Pollution reduction is easier for developed countries. But in case of developing countries, it is not so easy; in fact, it's a great challenge for them. Developing countries focus all their attention on high economic growth and development. As a result, they use all their capacities to achieve high growth rate, which ultimately worsen their environment. The study investigates the relationship between EPI score and GDP growth rate in the

context of BRICS countries. From the study, we found that from 2008 to 2016, BRICS countries average score of EPI are 72.2, 54.54, 43.87, 46.83 and 70.32, respectively, and average GDP growth rate are 5.42, 7.18, 3.46, 3.54 and 2.06 percent, respectively. From the data, we have seen that in 2010, BRICS countries, average EPI score is 54.54 and GDP growth rate 7.18 percent. In 2016, BRICS countries, average EPI score is 70.32 and GDP growth rate is 2.06 percent. Except for 2010, there is a negative relationship exist between EPI score and GDP growth rate. This is because of BRICS countries' awareness in environmental issues and they are trying to improve their environmental condition and concentrate on environmentally friendly economic growth and development pathway.

Frankel and Rose (2005) views on trade tend to reduce, and three measures should be carefully examined in BRICS countries, especially in case of China. According to Harris and Roach (2016), environmental issues, must take into account for environmental degradation and resource depletion, which should also be considered as one of the deciding factor to measure GDP growth rate. This is not only implied for developing countries, but also developed nations. Bangladesh can also change its GDP calculation procedure inclusion of environmental issues. Brazil, Russia, India, China and South Africa should improve further environmental scenario and be linked up with GDP growth rate. National accounting procedure should include environmental impact, which needs to be addressed by the policy makers.

However, in future researchers, we can do an investigation on the relationship between Environmental Performance Index and GDP growth rate at Bangladesh. Causes following non-existence of strong correlations among EPI and GDP growth rate may also be further investigated by future researchers at BRICS member countries. Further, a study may be done based on whether trade has disadvantageous consequences on the environmental issues of a country like Bangladesh.

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