Energy, environment and growth nexus in South Asia

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1.1 Introduction (Cont…)

- Rising economic growth in South Asia requires more energy inputs.
- This region has witnessed a positive growth trend over the last three decades.
- From 1981 to 2010, the highest average growth rate has been observed 6.2% for India while 5% for Pakistan, 4.9% for Sri Lanka, 4.8% for Bangladesh and 4.6% for Nepal.

1.1 Introduction

- There are serious concerns about rising demand for energy inputs and the volume of Green House Gas (GHG) emissions (Zeshan 2013, Shahbaz and Dube, 2012).
- The countries with higher energy consumption are adding more CO2 emissions in the environment(Shehbaz et al., 2012).
- South Asia requires such energy efficient measures that could ensure the minimum CO2 emissions (Ozturk, 2010).

1.2 Situation Analysis

Time	Bangladesh	India	Nepal	Pakistan	Sri Lanka
	Economic Growth				
1972-2010	4.8	**6.2**	4.6	5.0	4.9
	Energy Consumption				
1972-2010	**4.5**	4.3	2.8	4.3	2.6
	CO2 Emissions				
1972-2010	6.3	6.3	**8.2**	5.9	4.4

1.3 Motivation for the Study

- Growth hypothesis: presumes that energy consumption facilitates production process and is complement production growth (Akarca and Long, 1980).
- Conservation hypothesis: states that if higher energy consumption is unable to boost economic growth, a country should adopt conservation policies (Lai, 1997).
- Neutrality hypothesis: presumes no causal relationship between energy consumption and economic growth. Conservation policies would not be harmful (Akarca and Long, 1980).
- Feedback hypothesis: presumes a bidirectional causal relationship between energy consumption and economic growth (Yang, 2000).

2. Methodology (Cont…)

Levin and Lin (2002) panel unit root test:

- Operates under the null of a collective panel unit root against a collective panel stationary.

Im , *et al.*, (2003) panel unit root test:

- The null presumes all the variables are non-stationary against the alternative that a part of variables are stationary.

2. Methodology

Kao's (1999) panel cointegration test:

- Identifies a unique cointegrating vector among variables if all the variables are I (1).
- If all the integrated variables are cointegrated, dynamic error correction mechanism can discover the direction of causality.

3. Data and Variables

- Annual data covering the period 1980–2010.
- South Asian countries comprises Bangladesh, India, Nepal, Pakistan, and Sri Lanka.
- Following Al-mulali (2011) and Chang (2010), we have used three variables including:

1. GDP (real GDP, constant 2005 international $).
2. EC (energy consumption, constant 2005 kt of oil equivalent).
3. CO2 (CO2 Emissions, kg per 2005 PPP $ of GDP).

- All the variables are in natural logarithm, data source is World Development Indicators (WDI).

4.1 Results: Panel Unit Root Tests

	Levin and Lin Test		Im–Pesaran–Shin Test	
	Level		Level	First Difference
Variable	Unadjusted t-stat	Adjusted t-stat	w-t-bar stat	
GDP	-0.90	1.24	3.05	-3.28***
EC	-3.77	1.15	1.26	-1.44*
CO2	-3.23	0.88	2.27	-3.51***

(*** and * indicate 1* and 10% level of significance.)

- All the variables are unit root process.

4.2 Results: Kao's Panel Cointegration test

ADF	t-statistics	p-value
	-3.75**	0.03
Long-run Coefficients: (GDP is Dependent Variable)		
EC	0.81***	
CO2	-0.17***	
Intercept	0.33	

*** and ** indicate 1% and 5% significance level respectively.

4.3 Results: Causality Tests

Dependent Variable	Short-run Causality			Long-run Causality
	GDP	EC	CO2	
Δ GDP	-	1.15	2.71*	-0.55
EC	0.32	-	1.18	2.14**
CO2	1.96	6.37**	-	2.14**

** and * indicate 5% and 10% significance level respectively.

5. Conclusion (Cont…)

- CO2 emissions are adversely affecting South Asia's economic growth.
- A 1% increase in CO2 emission might reduce economic growth in South Asia by 0.17% in the long-run.
- Energy consumption positively affects the economic growth.
- A 1 % increase in energy consumption escalated the economic growth by 0.81% in the long-run.

5. Conclusion

- Short-run causality runs from energy consumption to CO2 emissions:

  Energy consumption → CO2 emissions
- Casualty runs from CO2 emissions to GDP :

  CO2 emissions → Economic growth.
- Absence of causal relationship between the energy consumption and economic growth:

  →Neutrality hypothesis.
- Error Correction coefficients portray that energy consumption and CO2 emissions both adjust themselves to rectify short-run disturbances in the system.

6. Policy Implications (Cont…)

- The CO2 emissions are adversely affecting the economic growth, there is a need to invest more in environment friendly technologies.
- The South Asian countries should set regional environment protection targets to overcome the increasing pollution in the region.
- The South Asian countries should meet at least once a year to discuss the devastating impact of rising CO2 emissions in the region and also to devise strategies to cope with these environmental challenges.

6. Policy Implications

- The presence of Neutrality hypothesis leads to adoption of conservation policies that might reduce CO2 emission without impeding the economic growth.
- Regional trade in energy can secure energy supplies in South Asia.
- This regional interdependency will also reduce the conflict in South Asia.

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