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Growth Convergence and Divergence in SAARC

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Abstract

We test for output convergence during 1960-2017 amongst the leading member countries of the South Asian Association for Regional Cooperation (SAARC): Bangladesh, India, Nepal, Pakistan and Sri Lanka. The context is SAARC's commitment to eventual monetary union. Existing research, using established unit root tests, finds little support for the convergence hypothesis, even when structural breaks are permitted. We use two more recently developed approaches, both of which allow greater flexibility in the depiction of convergence. The method developed by Enders and Lee (2011) allows for a smoothly evolving trend in relative per capita incomes, rather than a (possibly breaking) linear trend. The technique introduced by Phillips and Sul (2007, 2009) allows for the possibility of convergent sub-groups. Even with these more accommodating test procedures, we find minimal evidence of growth convergence within the full group of countries. We find that these countries can be allocated to two non-overlapping convergence clubs, with India and Sri Lanka enjoying the more favourable growth path. These findings raise questions regarding the current feasibility of monetary union for SAARC.

Keywords

SAARC, growth convergence, convergence clubs, flexible Fourier trend

1. Introduction

The South Asian Association for Regional Cooperation (SAARC).

Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka, was established in 1985 to promotemutual interests through collaboration in economic, social, cultural, technical and scientific fields. A commitment to full economic and monetary union was reiterated at the 18th SAARC summit in 2014. In this paper we assess the extent to which SAARC nations are achieving a

convergence in per capita GDP that will facilitate eventual monetary union.

2. Previous Studies

We begin with a brief introduction to the methods that have been employed. Let y_t be a country's per capita output series in logarithms. A negative relationship between y_t-y_s and y_s, s<t, is called "β-convergence" and implies convergence over time upon a country-specific steady state. A group of countries that are β-convergent with a common steady state can be expected to show a diminishing cross-sectional range of variation: "σ-convergence". A rigorous approach to testing for such a long-run diminishing trend in cross-sectional variance has been developed by Phillips and Sul (2007, 2009). Alternatively, consider y_t-r_t where r_t is log per capita output for some reference country or group. Rejection of a unit root in y_t-r_t constitutes "stochastic convergence" (Li & Papell, 1999). Full convergence additionally requires that deterministic terms are insignificant in the test regression or are convergent on zero.

Turning to existing studies of the SAARC countries, Chowdhury (2004), using data for 1960 - 2000, found no evidence of β-convergence or σ-convergence. Evans and Kim (2005), however, concluded in favour of β-convergence for Bangladesh, Pakistan and Sri Lanka, but not India. Evans and Kim (2011) found stochastic convergence in a panel of 13 Asian countries, and individually for Bangladesh, Pakistan and Sri Lanka. Jayanthakumaran and Lee (2013), employing the Lumsdaine and Papell (1997) "two breaks" unit root test for data covering 1973-2005 rejected stochastic convergence. Solarin et al. (2014), employing the Lee and Strazicich (2003) unit root test, with two endogenously dated breaks under both null and alternative hypotheses, found that only Bhutan shows evidence of stochastic convergence to the SAARC group mean.

These existing investigations of growth convergence within SAARC offer only slight support to a convergence hypothesis. Convergence is not always confirmed at the individual country level, and, when it exists, may be limited to "stochastic convergence". This prompts two questions: (i) whether evidence for convergence might be discovered by testing procedures that permit more flexibility in the specification of structural breaks, and (ii) whether evidence of convergence might exist for some subset(s) of the SAARC countries. These two questions are addressed below using data covering 1960-2017.

We continue with an introduction to the data in section 3, testing for stochastic convergence, using a flexible non-linear trend, in section 4, a search for convergent sub-groups in section 5, and conclusions in section 6.

3. Data

The key variable for this study is the logarithm of real per capita GDP, in 2010 $US, observed annually from 1960 until 2017, and graphed in Figure 1.

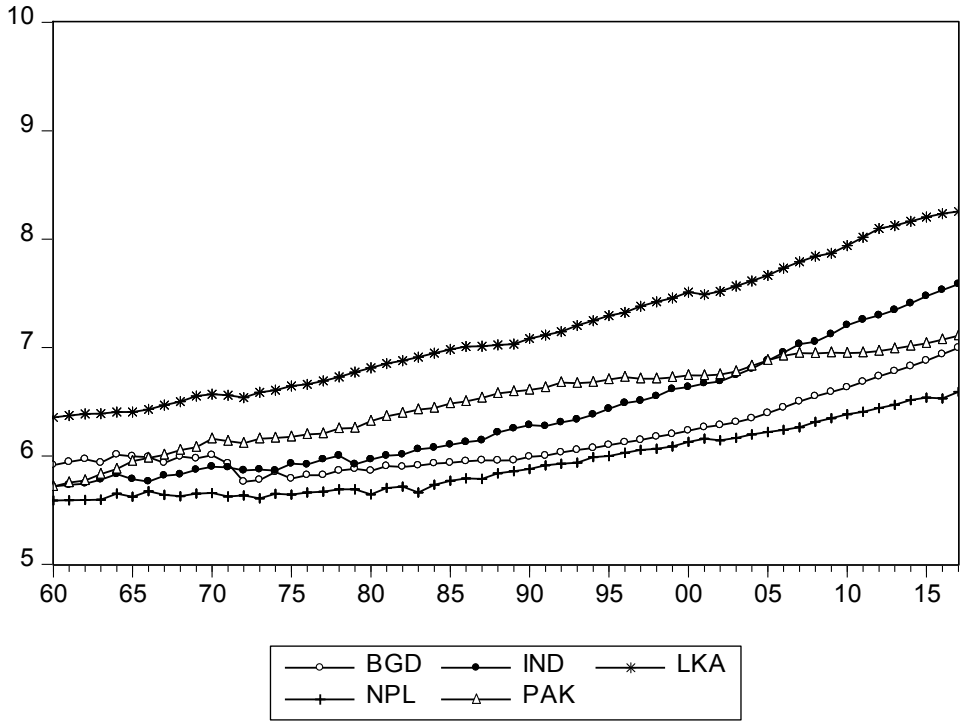

Figure 1. Log per Capita GDP, 2010$US, SAARC5 Countries 1960 - 2017

Data are sourced from the World Development Indicators website of the World Bank. The countries studied: Bangladesh (BGD), India (IND), Sri Lanka (LKA), Nepal (NPL), and Pakistan (PAK) are called here the SAARC5 group. The other SAARC members: Afghanistan, Bhutan and the Maldives, are excluded from the study because of the shortness of their GDP data series. These excluded countries together contribute no more than 1.0% of total SAARC GDP in the years where their data are available.

4. Assessing Stochastic Convergence

In an earlier working paper (Daly & Khan, 2016) we have applied a battery of unit root tests to assess stationarity of each SAARC5 member country's log per capita income relative to that of the group overall. Without structural breaks in the test equation, no test rejected a unit root at the 5% significance level for any country. When testing with one structural break (Zivot & Andrews, 1992), or two structural breaks (Lumsdaine & Papell, 1997) the unit root was rejected at significance levels around 10% for some countries but with no consistency in the selection of countries or the dating of structural breaks. These tests, however, characterise structural change with a small number of segmented linear

trends, which may not best accommodate the progress of developing economies.

For a more flexible characterisation of structural changes, Enders and Lee (2011) propose that, if breaks are not too many in number or too extreme in magnitude, a "flexible Fourier trend" Lagrange Multiplier (LM) unit root test, using a single trigonometric frequency, is appropriate. We apply that test here (Table 1), pre-testing for linearity and using the Schmidt and Phillips (1992). LM test with a linear trend when linearity is not rejected at a 10% significance level. The test equation is augmented with lagged terms as suggested by Enders and Lee (2011) with the lag length here determined by the rule: "long enough so that residual autocorrelation is absent and an additional lag would not improve the AIC".

Table 1. Unit Root Testing on Log Relative per Capita GDP with Flexible Trends

country	k	t-stat	5% cv	10% cv	lags
BGD	0	-1.918	-3.04	-2.76	3
IND	1	-3.878	-4.11	-3.83	0
LKA	0	-1.503	-3.04	-2.76	0
NPL	1	-4.854	-4.11	-3.83	0
PAK	1	-1.987	-4.11	-3.83	0

Note. Critical values are extrapolated from Enders and Lee (2011, Table 1) and Schmidt and Phillips (1992, Table 1a).

It is apparent in Table 1 that, even with this very flexible trend specification, the unit root null hypothesis is only rejected at a 5% significance level for Nepal. It is rejected marginally for India at a 10% significance level but we discount this result as a consequence of India's dominant size within SAARC—India has contributed over 70% of SAARC5 GDP throughout the sample period and over 80% in recent years. This lack of growth convergence across the board questions the sustainability of SAARC-wide monetary union in the near future. Nevertheless, it is possible that some sub-group(s) of countries might show evidence of mutual convergence—a question to which we now turn.

5. Searching for Convergence Clubs

We begin by looking for instances of stationarity in bilateral relative (log) per capita GDP, using the Enders and Lee (2011) procedure. Table 2 shows that several countries are involved in at least one country pair where the unit-root null is rejected at a significance level of 10%, suggesting that the possibility of some conver gentsub-group(s) should not be ruled out.

Table 2. Flexible Trend Unit Root Testing for Bilateral Differences in Log per Capita GDP

country 1	country 2	k	t-stat	5% cv	10% cv	lags
BGD	IND	0	-4.500	-3.04	-2.76	8
BGD	LKA	0	-1.242	-3.04	-2.76	0
BGD	NPL	0	-1.499	-3.04	-2.76	3
BGD	PAK	1	-2.167	-4.11	-3.83	0
IND	LKA	0	-1.439	-3.04	-2.76	0
IND	NPL	1	-4.979	-4.11	-3.83	0
IND	PAK	1	-2.222	-4.11	-3.83	0
LKA	NPL	0	-2.825	-3.04	-2.76	0
LKA	PAK	1	-3.152	-4.11	-3.83	5
NPL	PAK	1	-3.428	-4.11	-3.83	7

Note. Critical values are extrapolated from Enders and Lee (2011, Table 1) and Schmidt and Phillips (1992, Table 1a).

For a more formal, search for convergence clubs within SAARC5 we use the method of Phillips and Sul (2007, 2009). Their "log-t test" tests for long-run decline in the cross-sectional variance of log per capita GDP. The log-t test is obtained from a regression in which the regressand is based on the negative log of the cross-sectional variance series and the regressor is the logarithm of a linear time trend. A significantly negative coefficient is taken as evidence of divergence. We find that applying the log-t test to the SAARC5 group yields a negative t-statistic with a p-value below 0.0001, rejecting convergence for the full group.

The question remains whether there might be some convergent sub-groups. Phillips and Sul (2007, 2009) propose an algorithmic search strategy for exploring the 2^n-1 subgroups but here, with only n=5 countries, it is computationally feasible to simply test all possible sub-groups. We find that, in most sub-groups, the t-tatistic indicates divergence, beingsignificantly negative, with a p-value that is zero to four decimal places. Table 3 shows those few cases that have a larger p-value.

Table 3. Log-t Testing of SAARC5 Sub-Groups

sub-group members	t-statistic	one-tailed p-value
bgd npl pak	-1.508	0.1387
ind lka	-1.777	0.0824
bgd npl	-2.297	0.0264
bgd ind pak	-6.055	0.0000

Note. All other sub-groups have more negative t-statistics.

The log-t test identifies (Bangladesh, Nepal, Pakistan) and (India, Sri Lanka) as two mutually exclusive and independently convergent sub-groups. Given that Sri Lanka and India are the two highest ranked SAARC members in terms of per capita GDP during recent years, our results point to the possibility that the SAARC group is exhibiting "twin track" development, with India and Sri Lanka as a fast-track core group and the other nations being peripheral to this.

6. Conclusion

Employing a flexible, data-determined, representation of structural change, we find that Nepal is the only member of SAARC5 which has per capita income stochastically converging on the group mean. Nevertheless, when this same approach is used to assess stationarity of bilateral income relativities, we find some suggestion of stochastic convergence for sub-groups within SAARC5. Using the Phillips and Sul (2007, 2009) log-t test to identify such convergent sub-groups, we conclude thatthere is evidence suggesting twin-track development paths within SAARC5. India and Sri Lanka appear to be a convergent group enjoying a relatively favourable growth path, with Bangladesh, Nepal and Pakistan converging on a less prosperous growth path. This finding questions the sustainability of full monetary union for the SAARC countries.

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