



Is there conditional convergence in the per capita incomes of BIMAROU states in India?

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ARTICLE INFO

JEL codes:

O40
C12

Keywords:

BIMAROU
Income
Unit root
Convergence
India

ABSTRACT

The stochastic income convergence hypothesis is examined for five BIMAROU (Bihar, Madhya Pradesh, Rajasthan, Orissa and Uttar Pradesh) states in India for the period 1960–2012 using the univariate Narayan and Popp (2010) unit root test with two structural breaks. The per capita incomes of all BIMAROU states, except Uttar Pradesh, are found to be stochastically converging in the long run. Significant structural breaks are detected in the relative per capita income series of the BIMAROU states. Most of the breaks spotted in the relative per capita income series correspond with periods of political uncertainty and regime change in the state elections.

1. Introduction

Economic growth models based on New Growth Theory postulate that economies grow when the capital per hour worked increases and technological improvements take place. As the payoffs from using additional capital or better technology are greater for poorer economies, such economies should be able to increase their growth rate at a faster rate than richer economies, thus enabling them to catch up. Various studies in the literature have empirically investigated whether catch up, or convergence, has actually occurred for different groups of countries (Mankiw et al., 1992; Evans, 1996, 1997). Numerous other studies in the literature have tested the convergence hypothesis for diverse regions within a single country (see Young et al. (2008), Carlino and Mills (1993) for the United States; Canova and Marcet (1995) for regions in Western Europe; Jian et al. (1996), and Weeks and Yao (2003) for provinces in China; Koo et al. (1998) for 10 states in Korea; Ferreira (1999) for Brazil; Elias and Fuentes (1998) for Chile and Argentina; and De la Fuente (2002) for regions in Spain).

The notion of convergence, defined as inclusive growth, holds a pivotal place in Indian central planning. Over the years, the Finance Commission and Planning Commission took several steps to promote

regional equality through the intergovernmental transfer of resources (for details, refer to Ghosh (2013) and Rao et al. (2008)). Ghosh (2013) noted that inter-state variation in physical and social infrastructure has declined, though marginally, over the years. This may imply ensuing convergence for Indian states, as a large number of studies in the literature have found strong links between infrastructure and economic development of the region (such as Bandyopadhyay (2011) and Ghosh (2013)). In this article we empirically examine the convergence hypothesis for five of the poorest Indian states; namely, Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh and Orissa. We use the time series unit root testing approach to investigate the convergence hypothesis for these poorest Indian states. This approach tests for ‘stochastic convergence’.¹

In the early 1980s, demographer Ashish Bose examined selected demographic indicators for Indian states and found that Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh, which accounted for nearly 40% population of the country in 1981, very much lagged behind other states on those indicators. Given the poor demographic performance of these states, Bose coined the acronym BIMARU, formed from the first letters of the names of these states (i.e. BI: Bihar; MA: Madhya Pradesh; R: Rajasthan; U: Uttar Pradesh). As the

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¹ The notion of stochastic convergence implies that shocks to the income of a country (or a region within a country or state as in our case), relative to the average income of a group of countries (or regions or country), will be temporary. This entails testing the null hypothesis of a unit root in the log of the ratio of per capita income relative to the average. Failure to reject the null of the unit root suggests incomes are diverging and provides evidence against income convergence. Alternatively, rejection of the null hypothesis of the unit root supports income convergence. Since the test includes a constant term, stochastic convergence implies that incomes converge to a country- or region-specific compensating differential. Hence, stochastic convergence is consistent with conditional convergence (Strazicich et al., 2004).

<http://dx.doi.org/10.1016/j.econmod.2017.08.017>

Received 16 August 2017; Received in revised form 18 August 2017; Accepted 18 August 2017

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word ‘BIMARU’ resembles the Hindi word ‘BIMAR’, which means ‘sick’, Bose formulated the term to draw the attention of policymakers to the need to bridge the gap between the demographically ‘sick’ states that comprise BIMARU and the better-performing states of Kerala, Tamil Nadu, Andhra Pradesh and Karnataka. Bose cautioned that if the gap was not bridged, it may “cause social turbulence and may even pose a threat to political stability” (Sharma, 2015). Although the term BIMARU was originally used by Bose to indicate the poor performance of these states on demographic indicators, the acronym was soon used to refer to the economic backwardness of these states as well. Later, some scholars expanded BIMARU to BIMAROU (i.e. BI: Bihar; MA: Madhya Pradesh; R: Rajasthan; O: Orissa; U: Uttar Pradesh), including Orissa as well.

Although for many years BIMAROU states were held responsible for dragging down the GDP growth of India, some recent research suggests otherwise. Ahluwalia (2000), for example, contends that the so-called characterization of BIMAROU states as an homogeneous group of poor economic performers does not hold, particularly in the post-reform period 1991–1992 onwards. While many articles in newspapers, and popular media, have noted that BIMAROU states are no longer ‘sick’ because of their high economic growth rates in the post reform period (Sharma, 2015), there is no consensus on this subject. For example, Bhattacharya and Sakthivel (2004), and Kumar (2004) assert that the reforms of the 1990s widened the gap between the richer and poorer states. Purfield (2006) also suggests that the benefits of growth have remained concentrated in India’s richer states (i.e. Tamil Nadu, Gujarat, Haryana, Maharashtra and Punjab), leaving the poorer states of India (mainly the BIMAROU states and some small north-eastern states) further and further behind. Given these conflicting findings on convergence for the BIMAROU states, we revisits this issue by employing a time series approach based on the notion of stochastic convergence, with our empirical findings supporting stochastic convergence for all BIMAROU states except Uttar Pradesh.

A number of studies have examined the convergence hypothesis for per capita income of Indian states in a very general context, with the majority of these studies adopting a cross-sectional growth convergence equation approach. Very few studies, however, have used time series stochastic convergence to examine the income convergence hypothesis for Indian states.² This stochastic convergence approach is generally based on unit root tests, and is often criticized for low power and unreliable results due to its ignoring the possibility of structural breaks in the time-series framework (Ghosh, 2013). Taking into account this criticism, we test the stochastic income convergence hypothesis for the BIMAROU states of India for the period 1960–2012 using Narayan and Popp (2010) unit root test. This test allows for two structural breaks in the level and/or trend of the series. Essentially, this study tests for conditional income convergence of five BIMAROU states to the national average after accounting for initial conditions (incorporated in the intercept), cultural norms and transitional dynamics (trend)³ and major shocks (relative income series and structural breaks).

We contribute to the literature in two significant ways. First, the testing methodology we use is not prone to rejection of the null in the presence of a unit root with break(s), which is a well-documented criticism aimed at traditional univariate unit root tests such as the Augmented Dickey Fuller (ADF) and PP tests. In addition, with this approach, the rejection of the null hypothesis (of a unit root) unambiguously implies stationarity in contrast to earlier uses of unit root tests with breaks, in which rejection of the null may

indicate a unit root with break(s) rather than a stationary series with break(s). Second, the detection of these structural breaks carries significant implications for policy makers as state-specific conditioning variables such as physical infrastructure/investment expenditure (as measured by irrigation, electrification and railway track-building expenditure in Bandyopadhyay (2011), and Baddeley et al. (2006)), and social infrastructure (defined as human capital in Lahiri and Yi (2009)), can be permanently altered following a major shock and impose permanent changes on the time path of relative income. While we explore whether identified structural breaks can be linked to significant political, economic and environmental events that occurred around the same time in a particular state, it does not attempt to establish any causal relationship between such events and statistically significant breaks in income. The suggested events can only be taken as a likely cause of the structural breaks due to the close associations between the timing of the breaks and occurrence of the events.

The rest of the paper is organized as follows. Section 2 outlines the econometric methodology and argues that there is possibility of misspecification bias in conventional unit root tests in the presence of structural breaks in the data. This section also highlights the advantage of using the Narayan and Popp (2010) unit root test with structural breaks over ADF-type endogenous break tests and the more recent Lee and Strazicich’s (2003) LM unit root test. Section 3 describes the data and analyses its trends. This preliminary investigation of data seems to concur with a strand of existing literature that concludes that economic reforms favour the richer states of India, leaving the poorer states behind; Sections 4 and 5 present the results and discuss the location of structural breaks identified in the per capita income series. This section lists the most likely events that have caused structural breaks in income series of each of the five BIMAROU states and also analyses the effect of these shocks on the overall time path of the relative income series of that state; and Section 6 summarises the conclusions of the entire analysis and attempts to provide a definite answer to the question of convergence hypothesis for the BIMAROU states of India.

2. Econometric methodology

2.1. Conventional unit root tests

As a starting point, we use conventional univariate unit root testing methods without structural breaks. The rationale behind applying these three conventional tests is to use them as a benchmark against which to compare the respective test versions that include structural breaks. Comparison between these two sets of results, then, helps to identify the extent to which misspecification is due to ignoring structural breaks.

The conventional univariate unit root tests that we employ are the ADF (Dickey and Fuller, 1979), the KPSS stationarity test (Kwiatkowski et al., 1992), and the Lagrange multiplier (LM) unit root test (Schmidt and Phillips, 1992). The null hypothesis for the ADF and the LM unit root tests is that the relative (to the national average) per capita income series of state i contains a unit root. If the null of a unit root is accepted for the per capita income series of state i , this implies that shocks to the income of state i relative to average income (measured by per capita income at the national level) will be permanent. Hence, the per capita income of state i will diverge from national per capita income. On the contrary, if the null hypothesis of a unit root in the per capita income series of state i is rejected, this suggests that shocks to the income of state i , relative to national per capita income, will be temporary. Over the long term, the per capita income of state i will converge to the average national per capita income. The KPSS test differs from the ADF and LM unit root tests, however, in that it has a null hypothesis of stationarity against the alternative hypothesis of unit root. As these tests are well documented

² Refer to Mishra and Mishra (2015) for a list of such studies, their approaches and main results.

³ The inclusion of both intercept and time trend in the testing procedure will take care of initial conditions as well as transitional dynamics respectively, improving the power of the time series tests (for more details, refer to Mishra and Mishra (2017)).

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