



# Convergence dynamics of output: Do stochastic shocks and social polarization matter?



Mamata Parhi <sup>a,\*</sup>, Claude Diebolt <sup>b</sup>, Tapas Mishra <sup>a</sup>, Prashant Gupta <sup>a</sup>

<sup>a</sup> Department of Economics, Swansea University, Swansea, UK

<sup>b</sup> Bureau of Economic Theory and Applications, Louis-Pasteur University of Strasbourg, Strasbourg, France

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## ABSTRACT

This paper seeks to address two neglected aspects of convergence dynamics of cross-country per capita income. First, we allow evolutionary path of per capita income to contain stochastic shocks which may not converge fast enough to the long-run mean. Under this condition, we show that the conventional inference on  $\sigma$  convergence can be enlarged with more predictive power if one assumes, along with the necessary condition of  $\beta$  convergence, that the stochastic shocks are covariance stationary. Second, we argue that for economies to (conditionally) converge, they need to be sufficiently cohesive so that the growth of stochastic shocks is not sustained through complex socio-economic interactions. Empirical examination is carried out by analyzing time series properties of state per capita income in India and performing convergence analysis by conditioning a constructed social cohesion index based on indicators collected from the National Sample Survey. It is demonstrated that when the economy faces monotonic social segmentation, persistence of stochastic shocks considerably affects speed of per capita output convergence.

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## 1. Introduction

Both traditional theory of output convergence (based on the celebrated Solow–Swan model) and its recent extension (following on the success of endogenous growth theory) suffer from the important limitation that the relevance of slowly convergent shocks to the long-run mean is disregarded while outlining conditions under which (conditional)  $\beta$  and  $\sigma$  convergence<sup>1</sup> may occur among nations. Indeed, if one integrates literature from economic history, political economy, sociology and economic growth, one would find that non-mean convergent stochastic shocks are often found to be present in a segregated and socially alienated society and their magnitude of persistence is often found to be higher in the former than in a socially cohesive and stable society.

Presence or absence of convergence is not a completely economic phenomenon. If individuals' productivity in economic sense matters for aggregate national productivity, then it is essential to recognize the importance of social condition of individuals (i.e., if they are

cohesive or alienated) under which they produce. Relative social position of individuals<sup>2</sup> does affect productivity in a relative sense as individuals interacting in a stable and sustainable society produce externalities which are both socially and economically beneficial (for a recent survey, see for instance, Clark et al., 2008). The equilibria reached at under such societies are indicative of the high level of productivity growth which distinguishes itself from the outcome of a segregated society.

The sparse empirical studies have shown that polarized societies, as measured by ethnic fractionalization or income inequality, seem to be more prone to adopting growth-retarding policies. Moreover, social polarization may not only be responsible for coordination failure but is often thought to be associated with socio-political instability, which is by itself harmful to growth (e.g., Alesina et al., 1999). Majority of research, debates and policy discussions thus far have concentrated on developed societies, offering very little insights both with respect to rigorous theoretical and empirical analyses. In an era of rapid globalization and high internationalization of world economies, the effect of social polarization can have serious consequences for developing economies, especially because these economies' immediate objective is to achieve high growth and to be on the quality ladder of growth-success of developed economies. Second,

\* Corresponding author at: Department of Economics, Richard Price Building, Singleton Park, Swansea University, Swansea, SA2 8PP, UK.

E-mail addresses: [m.parhi@swansea.ac.uk](mailto:m.parhi@swansea.ac.uk) (M. Parhi), [cdiebolt@unistra.fr](mailto:cdiebolt@unistra.fr) (C. Diebolt), [t.k.mishra@swansea.ac.uk](mailto:t.k.mishra@swansea.ac.uk) (T. Mishra), [prashant.prashant@hotmail.com](mailto:prashant.prashant@hotmail.com) (P. Gupta).

<sup>1</sup> Broadly, when the dispersion of real per capita income across a group of economies falls over time, there is  $\sigma$  convergence. When the partial correlation between growth in income over time and its initial level are negative, there is  $\beta$  convergence.

<sup>2</sup> That is, whether some individuals enjoy more social benefit, for example, in terms of ethnic or caste based status leading to availability of greater economic opportunities.

some developing economies lend excessive emphasis on high growth for strategic political gains and building an effective deterrent to security threats from neighbors. In either case, growth without social limit is unstable and unsustainable.

In addition, even if one compares the optimization objectives of developed and developing worlds, the principal motive appears to remain the same, i.e., optimize growth subject to resource constraints along with securing a cohesive society, developing economies like India, face additional challenges. However, the priorities differ significantly for developing countries for two important reasons. First, along the growth trajectory, it is always difficult to jointly optimize growth and social cohesion<sup>3</sup> especially when the growth trajectory concerns pure economic gains from achieved convergence for developing economies. Second, once a steady state growth is achieved and high growth momentum is maintained (as in most developed economies), the joint optimization of growth and cohesion becomes relatively easier since the social planner needs to focus more on re-distribution of resources in the society to make it more stable and cohesive. In view of these unique reasons, it is necessary to understand how persistent lack of cohesion in developing economies affects both short and long-run objectives of high and sustainable growth.

Akerlof (1997) and Gradstein and Justman (2002) argued that individuals' utility in a society is interdependent and such interdependence generates externalities which can be both beneficial and counterproductive depending on whether high interdependence is facilitated among individuals who are polarized in the society or among those who are higher up in the social ladder. This micro-economic result has important implication for macroeconomic theory of convergence – that convergence of per capita income at cross-country level needs to be conditioned on social classes and distinctions. Arguably, socially cohesive societies create favorable conditions, for instance via education, whereas segmented societies tend to alienate themselves from optimum growth. Additionally but importantly, a stochastic shock always finds its way to long-run persistence in a transition and socially volatile than in a developed and relatively stable society. This is because segmented societies possess innate ability to endogenize stochastic shocks which can survive period after period unless the society moves up in the cohesion ladder. Nonetheless, it is the nature of the survivability of shocks which can impact the extent and speed of convergence. To the knowledge of the authors, this aspect of convergence dynamics has not yet been studied in the literature.

The empirical analysis is carried out for India where we examine the convergence properties of state real GDP per capita over two decades. Among several developing countries, India is a unique case because of persisting high growth momentum and equally widening social inequalities. Growth without proper re-distribution among various strata of society in India has provided impetus to recent debates and discussion both in academic and policy circles. Based on our theoretical arguments, it will be interesting to study convergence in state per capita GDP while high degree of social alienation and stochastic shocks are allowed to be persistent. There are a growing number of studies in India that have focused on the issue of regional growth and convergence in per capita real income across the states (see for instance, Aiyer, 2001; Bandyopadhyay, 2011; Sinha and Sinha, 2000). Bandyopadhyay (2011), and Bandyopadhyay (2012), for instance, employ both non-parametric and parametric methods to examine convergence dynamics and Aiyer (2001) employs panel data technique to examine convergence hypothesis. These and similar other studies employ a variety of methodological tools (e.g., panel unit root, cointegration, stochastic kernel density, etc.) which disregard the effects of slow and non-mean converging stochastic arising

from higher social segmentation. This paper aims to fill this void in the literature.

Although our emphasis would be on demonstrating how convergence speed is determined by social segmentation, the implications of our finding would be straightforward. As we will argue in the paper, alienated societies nurture non-mean convergent shocks more than highly-convergent shocks. The latter is a characteristic feature of cohesive societies. To inhibit the proliferation of stochastic shocks it is essential that the economies and societies need to be stable and increasingly cohesive, which in the long-run help in achieving desirable convergence speed across sectors. To explicate further, we first build an analytical model by extending the conventional framework of convergence by mixing micro foundation to the macro setting (Section 2). In the next step, we provide methods of testing such convergence (Section 3). Empirical analysis carried out by studying inter-regional convergence pattern for India is presented next (in Section 4). Finally in Section 5, we conclude with main implications of our analytical and empirical results.

## 2. Framework

In this section, we build a simple model describing the interrelationship between social segmentation and economic growth convergence. We demonstrate that socially fragmented economies experience higher persistence of shocks than socially cohesive societies and that the magnitude of shock persistence determines the convergence rate of economies. Although the framework we describe is applicable in cross-country setting, it can be better understood within a regional economy framework of a nation, because elements of a subset are assumed to share affinities within a broader set. The agents within the set are expected to experience common steady behavior mainly due to their 'closeness' defined in both geographic and relational sense.

However, exceptions may occur and by utilizing the argument of social conditioning theory, divergence is a meaningful possibility in the sense that agents, even in a 'close' society maintain individualities. To the extent they internalize private and public information on their social standing, divergence of growth may occur. In this case, divergence, rather than convergence may be growth-enhancing and welfare maximizing. Such divergence may not create a chaotic and segregated society if the individuals compete in terms of productivity and knowledge-enhancement. However, human mind is seldom consistently affixed to idealistic states. Comparison does arise in the human mind about their relative social and economic position. The competition and growth resulting from such a state may push the economy to low-level equilibrium trap, unless the social planner employs an equitable distribution plan over time. This argument has been stressed in Akerlof (1997) and Gradstein and Justman (2002) and has been the central argument among public policy analysts.

For the purpose of motivating our model, assume that the productivity,  $A$  of an individual  $i: i = (1, \dots, n)$  is a function of his relative position in the society, denoted by utility  $U$ , and stochastic shocks (both endogenous and exogenous) ( $\tau$ ) present at time point  $t: t = (1, \dots, T)$  of the economy. The individuals are assumed to enjoy both complete private and public information about his relative socio-economic position. This information set is denoted by  $\Omega$ . Additionally assume that each individual is endowed with initial level of human capital  $h_0$  and accumulated human capital denoted as  $H_t = h_0 + e^{\lambda t}$ , where  $\lambda$  is the efficiency gained over time through and the growth of human capital is denoted by  $e^{\lambda t}$ .<sup>4</sup> Thus, at time  $t$ , the productivity,  $A$  of individual  $i$  can be defined by

$$A_{it} = F(U_{it}, H_{it}; \Omega) \quad (1)$$

<sup>3</sup> We follow Chan et al. (2006) and define social cohesion 'as a state of affairs concerning both the vertical and the horizontal interactions among members of a society, as characterized by a set of attitudes and norms that include trust, a sense of belonging, and willingness to participate and help, as well as the behavioural manifestations'.

<sup>4</sup> At idealistic state,  $h_0$  is assumed to be equal for all  $i$  emphasizing thus on the direct influence of social planner in maximizing welfare via education policy.

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