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Abstract

This study is an attempt to empirically analyze the effect of fiscal transfers on growth and regional growth convergence during 2005-2019, using the standard growth convergence model for panel data. Results indicate the growth convergence across Indian States. The regional income gaps reduced at a rate of 17.7-31.9 percent *per annum. The fiscal transfers contribute to the growth of 22 out of 29 States and also contribute significantly to the convergence. Moreover, there is strong evidence for convergence across General Category States and across Special Category States, indicating club convergence. The average income growth is higher in Special Category States and higher in post global crisis period. It is our hope that these results will be useful to policymakers and other stakeholders to take appropriate strategies to design fiscal transfer policy such that it will speed up the convergence process.*

Keywords: *Growth Convergence, Fiscal Transfers, Indian States, Panel Data Methods*
JEL Codes: *E22,E62, R11, R12, R23, C23*

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INTRODUCTION

Intergovernmental transfers are important policy instruments for nations (Oates, 1999). They may serve a number of different functions. They can be used for revenue sharing purposes and they can internalize spill-over effects to other jurisdictions (Ganaie *et. al.*, 2018). Many including Bird and Smart (2010) argue that they can also provide fiscal equalization and thereby combat disparities across jurisdictions.

There are three channels by which transfers could ease the regional disparity. First, more transfers to less developed regions could directly narrow the regional income gap. Second, transfers to finance more investments in health, education and infrastructure in poor regions could improve their growth potential and ease the disparity in the longer term. Third, transfers could reduce the tax burden in the recipient (poor) regions and thereby give additional simulation to them.[1] Studies such as Kaufman *et. al.*, (2003), and Maciel *et. al.*, (2008) find a positive effect of transfers on convergences among Canadian provinces and Brazil respectively. Therefore, fiscal transfers become more relevant in an economy like India with larger regional inequalities and income disparity.

Although India has achieved acceleration in growth after reforms and emerged as one of the fastest growing emerging economies, its regional spread has been uneven. There are indications of poverty reduction and improvement in many indices of quality life in the post reform period. At the same time, there are evidences for widening regional disparities in income and other development indices (Ahluwalia, 2000). For instances, among the Indian States, Goa had the highest per capita income (in 2011-12 constant prices) of Rs. 4,07,158 in 2018-19 and Bihar had the lowest income of Rs. 31,626. The coefficient of variation in per capita incomes (in 2011-12 prices) among Indian States increasing from 0.423 in 1993-94 to 0.604 in 2018-19.

[1]However, Barro (1999) argues that transfers and associated tax finance will generally distort economic decisions. A greater level of income redistribution will induce more distortions which tend to reduce investment and thus slow down economic growth.

In India, both General Category States (GCS) and Special Category States (SCS) have been receiving Central transfers which come from Finance Commission's tax devolution (shared tax) and grants and grants under various Centrally Sponsored Schemes (CSS) since 1950. The Central transfers have played an important role in the State Governments budgets. During 2011-12 to 2018-19, the share of Central transfers in the total revenue receipts of (29) Indian States ranged between 38.3 percent (2013-14) and 47.1 percent (2016-17).[2] Majority of the transfers were unconditional and a small portion of them was conditional or specific. There are sharp differences in the level of federal transfers to States in different years. In this context, the following important questions that emerge are; (i) whether the process of income convergence happens in India or not? (ii) whether the process of income convergence happens among GCS and among SCS? (iii) whether the fiscal transfer policy in India can contribute to the income convergence or divergence among all States, among GCS and among SCS? and (iv) whether the fiscal transfer policy impedes income growth of Indian States? This study is an attempt to answer these questions using the data for 29 Indian States during 2004-05 to 2018-19 and Barro and Sala-i-Martin (1991)'s standard growth convergence model for panel data.

The main contributions of this study are as follows. Firstly, while a few studies have attempted to test the relationship between transfers and income convergences in other countries, all earlier studies in the Indian context either analyze the absolute and/or conditional convergence without taking into account the role of transfers (Nagaraj *et. al.*, 1998; Rao *et. al.*1999; Mishra, 2003; Shanmugam, 2012) or analyze descriptively the relationship between transfers and growth (Rangarajan and Srivastava, 2004; Bagchi, 2003; Cashin and Sahay, 1996). This is the first study empirically investigating the role of fiscal transfer policy on regional growth and regional convergence in India.

[2]As per the XVth Finance Commission Report, Vol. IV The States, October 2020.

Secondly, as earlier studies use data for different periods in past decades and provide mixed results on income convergence, this study uses the latest available data. Thirdly, it also analyzes the club convergence issue separately for larger (General Category) States and small (Special Category) States with similar characteristics. Fourthly, it also empirically examines in which of the States, transfers positively contribute to the growth and in which of the States they impede the income growth and in which of the States, they do not influence the growth. These State specific results might be useful for policy makers to design appropriate strategies to achieve a balanced regional growth. Finally, while this study provides policy implications based on Indian experience, they may be relevant for other similar nations.

This study proceeds as follows. The next Section provides a brief note on the fiscal transfer policy in India. The following two Sections briefly review the literature on the study topic and explain the empirical model, the data and the estimation technique to be employed. The subsequent Section presents and discusses the empirical results and the final Section provides the concluding remarks of the study.

INTERGOVERNMENTAL TRANSFERS IN INDIA

The Indian Constitution (1950) provided for a two-tier federal system of Governments, namely the Centre (or National or Federal Government), and the State (or sub-national) Governments.[3] It assigned separate tax powers and expenditure responsibilities to them. It assigned almost all mobile and buoyant taxes to the Centre and more expenditure responsibilities to States. In order to bridge the vertical as well as horizontal fiscal imbalances it made a provision for the appointment of Finance Commission (FC) once in every 5 years to make recommendations on sharing the Centre's tax revenues with States and on grants-in–aid to the States. The Planning Commission (PC) was

[3]In 1992, the 73rd and 74th Constitutional amendments empowered the urban and the rural local governments as the third tier.

appointed through Cabinet Resolution in 1950 to determine the planning grants to States for their effective and balanced utilization. Central ministries also transfer resources through various CSS. As the PC was abolished in August 2014, currently the FC and the Central Ministries are the sources of fiscal transfers to States.

In relative terms, a larger volume of transfers is given through the sharing of Centre's taxes. This volume is determined by the overall share of States in the divisible pool. This aspect of transfer is referred to as vertical devolution. For instances, the XII FC recommended 30.5 percent share to States, while XIII FC recommended 32 percent. Due to abolition of PC, the XIV FC recommended 42 percent share. With the change in the status of Jammu and Kashmir (J and K) as Union territory, the XV FC recommended 41 percent share. Almost all Commissions gave considerable weightage to the distance criterion for achieving horizontal equity, i.e., providing higher per capita transfers to lower per capita fiscal capacity States. Other criteria used by the recent FCs include population and demographic change, area and forest cover. The XV FC has re-introduced the tax effort criterion which was dropped by XIII FC and XIV FC.

Table 1 shows the share of FC transfers and non-FC transfers as proportion of Gross Revenue Receipts and GDP since XII FC period (2005-10). It is observed that there has been both a shift in the quantum of total transfers and its composition. The transfers-GDP ratio increased from 5.76 percent during the XIII FC period to 6.30 percent during the first 4 years of the XIV FC period. The shift is quite visible when the ratio increased from 5.35 percent in 2014-15 to 6.39 percent in 2018-19. The impact of increase in devolution from 32 percent to 42 percent can be clearly observed in the share of devolution in the gross revenue receipts, which increased from 23.8 percent in XIII FC period to 31.37 percent in the first 4 years of the XIV FC award period. A significant shift in the composition can be seen. In 2014-15, about 59.9 percent of total transfers were through the FC route. This increased to 70.5 percent in 2018-19.

BRIEF REVIEW OF LITERATURE

Two different approaches have emerged in the literature to measure the convergence. The first approach is the "Traditional or Classical Approach". The theoretical foundations of the classical approach can be traced back to the neo-classical Solow-Swan-Ramsey model of growth. The empirical foundation of this approach is the seminal contributions of Barro and Sala-i-Martin (1991, 1992). It considers two notions of convergence: sigma (σ) convergence and beta (β) convergence. The former requires cross sectional disparity of per capita income to decline over time. That is, if the coefficient of variation or standard deviation of per capita income tends to decline over time, there is an evidence of σ convergence.

Table 1: Transfers from the Centre to States as Proportion of Gross Revenue Receipts of the Centre

(in per cent)

Finance Commission	Share in Central Taxes	FC Grants	Total FC Transfers	Non-FC Transfers	Total Transfers	Transfers as percent of GDP
XII FC (2005-10)	**22.03**	**4.35**	**26.38**	**21.01**	**47.39**	**6.03**
XIII FC (2010-15)	**23.8**	**3.96**	**27.75**	**20.47**	**48.22**	**5.76**
2010-11	21.68	3.12	24.79	23.87	48.66	6.45
2011-12	25.27	4.35	29.62	23.73	53.35	6.17
2012-13	24.84	3.86	28.7	19.96	48.66	5.74
2013-14	23.79	4.03	27.82	17.93	45.75	5.45
2014-15	23.41	4.28	27.7	18.57	46.27	5.35
XIV FC (2015-20)	**31.37**	**4.51**	**35.88**	**14.74**	**50.62**	**6.3**
2015-16	29.66	4.96	34.61	13.24	47.86	5.93
2016-17	30.57	4.8	35.38	13.04	48.41	6.26
2017-18	31.87	4.37	36.24	16.77	53.01	6.55
2018-19	32.88	4.05	36.92	15.45	52.38	6.39
2019-20RE	26.15	4.93	31.08	18.61	49.69	6.1
XV FC (2020-26)						
2020-21(BE)	27.93	5.34	33.27	18.22	51.48	6.43

Source: XV FC Report, Vol. 1: Main Report, October 2020. RE-revised estimates; BE-budget estimates.

The latter on the other hand, requires poorer economies to grow faster than richer ones. It has been well established in the literature that beta convergence is a necessary but not a sufficient condition for sigma convergence (Barro and Sala-i-Martin, 1995). The key assumption of the (β) convergence hypothesis is that poor economies in general endowed with less stock of physical capital and hence higher marginal rates of return on capital. Therefore, for any given rate of investment, the relatively backward regions will have faster growth in the transition phase. It has substantive implications that current per capita income differences among regions will narrow.

The literature on the topic argues that the beta convergence implied by the Solow model is conditional and perceptible only after other factors that may cause variations in steady states have been accounted for. Anything that drives apart investment rates in rich and backward regions will *ceteris paribus* drive their steady-state income (a steady state is a situation in which various quantities grow at constant rate) levels apart even as each region is converging to its diverging steady state.[4] For economies, which differ in their steady states, Barro (1991) suggested the possibility of conditional convergence, which states that the farther away an economy is from its steady state, the faster it should grow. Mankiw *et. al.*, (1992) suggest that when growth can be modeled as a function of the determinants of steady state, the initial level of income is a natural way to study the convergence. A positive and significant coefficient of initial level of income indicates the existence of convergence. This approach can be used to test for both absolute and conditional convergence.

Further the conditional convergence can be related to "Club Convergence", which can be traced back to Baumol (1986), but its more

[4] In contrast to this, one can postulate that all regions in the long run have no tendency to display variation in the rates of investment, capital depreciation, population growth etc. In such case, the model will generate unconditional or absolute convergence to a common steady state per capita income. In other words, if all the economies in a group have the same steady state, poorer economies in the group should grow faster, which is called absolute convergence.

rigorous formulations owes to Durlauf and Johnson (1995) and Galor (1996). In the case of conditional convergence, equilibrium differs by the economy and each economy approaches its own but unique equilibrium. In contrast, the club convergence is based on models that yield multiple equilibrium. An economy will reach one of these different equilibriums depending on its initial position or some other characteristics. A group of economies/States may reach a particular equilibrium if they share the initial location or attribute corresponding to that equilibrium. However, many argue that evidence of conditional convergence is to a large extent consistent with the club convergence.

The second approach is "Distributional Approach". It originated with the work of Quah (1993, 1996 and 1997). Rather than exploring measures of position and dispersion, it focuses on the distributional dynamics of the data. The specific methodology consists in estimating kernel densities for variable relative to the national average. Since the classical model assumes no technical progress in the growth process and growth is entirely due to capital accumulation, it is very popular in the literature.

The simple convergence model has been empirically tested for many countries in a series of studies including Barro (1991), Barro and Sala-i-Martin (1991, 1992, 1997), and Sala-i-Martin (1996), Quah (1995), Bernard and Durlauf (1996), and Rodrick (2003, 2011). There is also a large literature on convergence of per capita income across Indian States (Baddeley *et. al.*, 2006; Marjit and Mitra, 1996; Rao *et. al.*, 1999; Das Gupta *et. al.*, 2000; Bajpai and Sachs, 1996; Sinha and Sinha, 2002; Nagaraj *et. al.*, 1998; Mishra, 2003; Shanmugam, 2012). These studies provide mixed results on the regional growth convergence in India based on different samples of States over different time spans. For example, Mishra (2003), Shanmugam (2012), find strong evidence of conditional convergence while Rao *et. al.*, (1999), Bajpai and Sachs (1996) and Sinha and Sinha (2002) find divergence.

Nagaraj *et. al.*, (1998) argue that infrastructures can be the most important determinants of economic performance of Indian States. Mallick (2014) examined the club convergence and conditional convergence of economic growth of 15 major Indian States during 1993-94 to 2004-05 and found that there is club convergence within middle income States and a process of conditional convergence exists by conditioning private and public investment. Bandyopadhyay (2012) finds evidence of two convergence clubs in India, one at 50 percent and another at 125 percent of average national income.

The relationship between federal transfers and economic (income) convergence has been profusely investigated in the empirical literature. For instances, Coulumbe and Lee (1995) and Kaufman *et. al.*, (2003) find a positive effect of transfers on convergence of Canadian provinces while Rodrigues (2006) finds not significant effect. Martinez-Vazquer and Timofee (2010) find a negative effect of federal transfers on regional economic convergence in the Russian Federation. Maciel *et. al.*, (2008) show that transfers to States/Municipalities have a positive impact on the regional convergence in Brazil. Ferrieira Dias and Silva (2006), however, find no significant effect on regional convergence in Portugal.

As indicated above, a few studies analyze descriptively the relationship between fiscal transfers and growth in the Indian context. For instance, Cashin and Sahay (1996) show that per capita incomes in the States in India have been slowly converging and this convergence has been aided by grants from the Central Government to the States. However, Bagchi (2003) finds that regional disparities have increased in India during the last 50 years despite the persistence of fiscal transfers to the regions. Rangarajan and Srivastava (2004) argue that transfers are associated with regional economic convergence. This brief review highlights that there is hardly any study to empirically analyze the effect of fiscal transfers on regional growth and regional convergence in India and to use the latest data. This study is an attempt to bridge the gap in the literature.

EMPIRICAL MODEL, DATA AND ESTIMATION

The summary form of the neo classical Solow-Swan-Ramsay model of growth can be shown in the following equation:

$$G_y = (d \log y_t / dt) = \lambda [\log y^* - \log y_0] \quad (1)$$

where y_t is per capita income or output at year t, G_y is the growth of per capita income, y^* is the steady state per capita income and λ is the convergence coefficient which measures how rapidly an economy's output per capita approaches its steady state value. For instance, if the speed of convergence λ =0.05 per year, then 5 percent of the gap between per capita output and its steady state value vanishes in 1 year. When $y^* > y$, y is growing.

Solution to the differential equation (1) will become:

$$\log y_t = (1- e^{-\lambda t}) \log (y^*) + e^{-\lambda t} \log y_0 \quad (2)$$

The equation (2) basically indicates that log of per capita income is the weighted average of log of initial and log of steady state income. The equation (2) can also be written as:

$$\log y_t - \log y_0 = (1-e^{-\lambda t}) \log (y^*) – (1- e^{-\lambda t}) \log y_0 = \alpha - \beta \log y_0 \quad (3)$$

where $\alpha = \beta \log y^*$ and $\beta = (1-e^{-\lambda t})$. Therefore, $\log y^* = \alpha/ \beta$ and $\lambda = -\log (1- \beta)$. In (3), λ is called the absolute convergence coefficient. In such a case, all regions will have the same steady state income. The linear specification of the panel data conditional convergence growth model can be written as:

$$1/T \log (y_{i,t} / y_{i,t-1}) = \alpha + \beta \log y_{i,t-1} + \theta X_{it} + \eta_i + \mu_t + \varepsilon_{i,t} \quad (4)$$

The left hand side term of above equation is the annual growth rate of per capita income of the ith region in year t; T is time length (one year here), X is a vector of determinants of growth like fiscal transfers, infrastructure indicator, human development indicator etc.[5] This indicates that the lower the initial income of a region, the higher will be its growth rate for given values of X. That is, poor regions grow faster than the rich regions. Therefore the sign of β (or λ) is negative. This is known as conditional convergence. η_i region (State) specific effect which captures the impact of unobserved heterogeneity in the model and μ_t will capture the time specific impacts. Specifically, the X vector in this study includes log of real per capita Central transfers to State i in year t (log FT_{it}), log of road length (log RL_{it}), log of per capita power availability (log PA_{it}) and a dummy indicator for post global financial crisis period (PGC).[6] It is noted that the transfers variable, the important study variable, is included to analyze the effect of this variable on growth and growth convergence; road length and power availability are infrastructure indicators that are expected to have positive impact on growth; and the dummy for post global crisis period is included to check whether the growth has affected after the crisis or not. The PCG is dropped when time effect is significant due to perfect collinearity. Thus, the study employs the following empirical model:

$$1/T \log (y_{i,t} / y_{i,t-1}) = \alpha + \beta \log y_{i,t-1} + \theta_1 \log FT_{it} + \theta_2 \log RL_{it} + \theta_3 \log PA_{it} + \theta_4 PGC + \eta_i + \mu_t + \varepsilon_{i,t} \quad (5)$$

The data source for per capita income (i.e., per capita Gross State Domestic Product) for 29 Indian States during 2004-05 to 2018-19 (in 2011-12 prices) is NSO and EPW Research Foundation. The fiscal

[5] Durlauf and Quah (1999) argue that over 90 different conditioning (X) variables have been appeared in existing studies, which analyze country level data. At the State level, most variables are not relevant and many State specific variables are not available or unobservable. Therefore, all conditioning variables can be subsumed under the region (State) specific fixed effects instead of explicitly modeling a few variables.

[6] In the initial estimation, it has included a few other variables like railway length, percent of non-primary sector GSDP in total GSDP etc. As they are not significant, they are dropped in the final analysis.

transfers to each State are compiled from the Comptroller and Auditor General (CAG) of India Audit Reports and Finance Accounts of the various State Governments. The real values of the fiscal transfers are computed using the GSDP deflator of the respective States. The data source for two infrastructure variables- road length and per capital power availability is RBI's Handbook of Statistics on State Economy. Due to growth rate calculation, one observation for each state is lost. Therefore, the total observations included in the final analysis are: 29 x 14 = 406.

The sample States included are: (i) General Category States (GCS): Andhra Pradesh, Bihar, Chhatisgarh, Gujarat, Haryana, Jharkand, Karnataka, Kerala, Madhaya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh, Uttarakhand and West Bengal; (ii) Special Category States (SCS): Arunachal Pradesh, Assam, Goa, Himachal Pradesh, Jammu and Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. Evidences indicate that of the total GSDP of 29 States, the share of 11 SCS is only about 5 percent. To analyze the effect of fiscal transfers on growth of each individual State, the fiscal transfer variable is allowed to interact with State dummies in an alternative specification of the model. Finally, separate (split sample) analyses are done for the GCS and SCS as their fiscal/income characteristics differ.

The above growth equation (5) can be estimated using the standard (static) panel data estimation techniques: fixed effects (FE) or random effects (RE) method. The former assumes a correlation between the explanatory variables included in the model and the unobserved individual (State) effect and year effect while the latter assumes no such correlation. The FE model can be estimated using the Least Square Dummy Variable (LSDV) procedure by incorporating State dummies and year dummies along with other explanatory variables or "within estimation" procedure. The RE model can be estimated using the feasible Generalized Least Square (FGLS) procedure. The Chow test is used to choose one way or two-way model while the Hausman Statistics is used

to select FE or RE model. Table 2 presents the means and the standard deviations of the study variables. The average real rate of growth is 6.5 percent for GCS and 6.1 percent for SCS. However, the average per capita real income of SGC is higher than that of GCS. The average real per capita transfers to SGS is almost 5 times higher than the average transfers to GCS.

Table 2: Means and Standard Deviations of the Study Variables

Variables	All States		General Category States		Special Category States	
	Mean	S.D	Mean	S.D	Mean	S.D
Real Per Capita Income Growth	0.064	0.05	0.065	0.04	0.061	0.07
Lag of Real Per Capita Income	81751.031	49975.57	77366.738	36705.32	88925.328	65707.47
Real Per Capita Transfers	9974.626	10858.65	3960.032	1888.59	19816.689	12213.99
Road Length	141845.670	131665.93	198704.960	125496.24	48803.196	77548.07
Per Capita Power Availability	802.476	552.79	872.860	469.11	687.304	652.97
Post Crisis Period Dummy	0.714	0.45	0.714	0.45	0.714	0.45
Sample Size	406		252		154	

EMPIRICAL RESULTS

Before analyzing the β convergence which is only a necessary condition and the effect of the fiscal transfers on growth, testing results for σ (sigma) convergence of per capita income and per capita transfers are shown in Table 3. It is observed that the dispersion (Standard deviation) of per capita income is characterized by a positive and significant trend for all Indian States, for GCS and for SGS. However, the dispersion of per capita fiscal transfers is characterized by a negative trend and is significant in the case of all States and Special Category States. These results indicate the σ convergence of per capita transfers and not of per capita income.

(i) Full Sample (All States) Results: Table 4 presents the conditional convergence analyses results of equation (6) using data from all 29 Indian States. Model 1 excludes log per capita transfers and Post Global Crisis period dummy. The Hausman and Chow test (F) statistics support a one way fixed effects model. As expected, the coefficient of initial per capita income (β) is negative and statistically significant at 1 percent level, indicating a strong evidence for conditional convergence in per capita income (i.e., poorer States grew faster than richer ones). The speed of convergence (the rate at which the economy converges towards its steady state income), λ is 0.128. Due to the empirical setting, this rate is the same for all States in the sample. [7] As expected, the per capita power availability is positively and significantly associated with growth. While the road length is positively related to growth, its effect is not significant even at 10 percent level.

Table 3: Trends in S.D of Per Capita Income and Per Capita Transfers

Year	All States		General Category		Special Category	
	Per Capita Income	Per Capita Transfers	Per Capita Income	Per Capita Transfers	Per Capita Income	Per Capita Transfers
2005-06	0.460	0.920	0.460	0.292	0.471	0.666
2006-07	0.463	0.897	0.462	0.305	0.481	0.676
2007-08	0.467	0.865	0.473	0.303	0.478	0.638
2008-09	0.464	0.892	0.465	0.298	0.483	0.689
2009-10	0.492	0.922	0.474	0.298	0.536	0.728
2010-11	0.498	0.913	0.470	0.316	0.560	0.629
2011-12	0.510	0.908	0.469	0.300	0.588	0.651
2012-13	0.494	0.927	0.474	0.301	0.547	0.626
2013-14	0.486	0.896	0.485	0.283	0.511	0.634
2014-15	0.509	0.867	0.492	0.286	0.555	0.641
2015-16	0.526	0.790	0.510	0.288	0.573	0.567
2016-17	0.531	0.785	0.510	0.291	0.588	0.560
2017-18	0.542	0.797	0.521	0.313	0.599	0.568
2018-19	0.551	0.779	0.525	0.266	0.617	0.571
Linear Trend Growth						
Coefficient (t value)	0.007 (9.88)	-0.01 (-4.14)	0.005 (8.82)	-0.001 (-1.59)	0.010 (6.21)	-0.009 (-4.69)

[7] This assumption of common rate of convergence is tenable for all Indian States which are likely to be similar in terms of the underlying parameters of technology and preferences. This rate indicates that any sample State on an average reduces 12.8 percent of the gap between its steady state income and initial income every year.

In Model 2, the per capita transfer variable is included. Its coefficient is positive and statistically significant at 1 percent level, indicating that the fiscal transfer policy in India induces the growth of State economies. Due to its inclusion in Model 2, the value of coefficient β changed to -0.194 and the λ-speed of convergence rate increased from 12.8 percent to 17.7 percent. This is clear evidence that fiscal transfers contribute significantly to the income convergence of Indian States. Model 3 includes the dummy indicator for post global crisis period (PGC) and excludes the fiscal transfer variable. It has a positive and significant impact on growth, indicating that the average growth in the post global crisis period was relatively high as compared to the pre-crisis period. This result is consistent with the result of Micallef (2020) which shows a strong economic growth after the 2008-09 financial crisis in Malta.

The coefficient of initial income is negative and statistically significant at 1 percent level. The convergence coefficient value is 0.143. Model 4 includes additionally the per capita transfer variable. As expected, it has a positive and significant effect on growth. Moreover, its inclusion increases the magnitude of λ convergence coefficient to 0.198.

Model 5 of Table 5 is an alternative specification of Model 2 in Table 4. The difference is that the transfer variable is allowed to interact with State dummies in order to examine the effect of transfers on growth of each individual State. The λ value is further increased to 0.262. Interestingly in all 18 General Category States, the effect of transfers on growth is positive. But its effect is not statistically significant at 5 percent level in Bihar, Jharkhand, Punjab, Uttar Pradesh and West Bengal. However, it is significant at 10 percent level in Jharkhand, Punjab and Uttar Pradesh. Moreover, the effect of transfers on growth is positive and statistically significant at 5 percent level in 6 Special Category States- Assam, Goa, Himachal Pradesh, Mizoram, Sikkim and Tripura. In remaining 5 SCSs, it is not significant.

Table 4: Panel Conditional Convergence: One-way Fixed Effects Model Results

Variables	Model 1		Model 2		Model 3		Model 4	
	Coeffi-cient	t-ratio	Coeffic Ient	t-ratio	Coeffi-cient	t-ratio	Coeffi-cient	t-ratio
Constant (γ_1)	0.566	4.88	0.802	6.63	0.804	4.84	1.107	6.53
Ln Per Capita Income$_{t-1}$ (γ_2)	-0.136	-6.5	-0.194	-8.4	-0.154	-6.78	-0.219	-8.78
Ln Per Capita Transfers (γ_3)			0.076	5.19			0.079	5.43
Ln Road Length (γ_4)	0.018	1.46	0.011	0.93	0.016	1.33	0.009	0.73
Ln Power Availability (γ_5)	0.117	5.42	0.099	4.66	0.114	5.26	0.094	4.43
Post Crisis Period Dummy (γ_6)					0.017	2.00	0.021	2.54
R Square	0.226		0.265		0.220			
Hausman Statistics	49.52		81.58		52.53			
State Dummies								
General Category States								
Bihar	0.046	1.36	-0.063	-1.63	0.015	0.42	-0.105	-2.51
Chattisgarh	0.014	0.68	-0.021	-1.00	0.009	0.44	-0.028	-1.36
Gujarat	0.012	0.60	0.066	3.07	0.018	0.92	0.077	3.51
Haryana	0.032	1.13	0.093	3.15	0.039	1.38	0.104	3.52
Jharkhand	0.118	3.52	0.048	1.38	0.100	2.87	0.022	0.62
Karnataka	0.045	2.21	0.073	3.54	0.051	2.48	0.081	3.92
Kerala	0.099	3.96	0.124	5.04	0.103	4.14	0.131	5.32
Madhya Pradesh	-0.050	-2.25	-0.089	-3.91	-0.061	-2.69	-0.105	-4.48
Maharashtra	0.021	1.01	0.087	3.63	0.030	1.41	0.101	4.13
Orissa	0.011	0.50	-0.037	-1.61	0.004	0.18	-0.048	-2.05
Punjab	-0.040	-1.74	0.009	0.38	-0.035	-1.53	0.017	0.71
Rajasthan	-0.020	-1.01	-0.031	-1.59	-0.025	-1.24	-0.037	-1.92
Tamil Nadu	0.019	0.99	0.055	2.83	0.024	1.28	0.064	3.24
Telangana	0.040	2.04	0.063	3.18	0.044	2.21	0.068	3.45
Uttar Pradesh	-0.027	-0.96	-0.073	-2.55	-0.043	-1.47	-0.095	-3.19
Uttarakhand	0.081	3.16	0.042	1.62	0.085	3.31	0.045	1.75
West Bengal	0.022	0.89	0.003	0.13	0.014	0.56	-0.008	-0.31
Special Category States								
Arunachal Pradesh	0.131	3.59	-0.071	-1.35	0.125	3.42	-0.087	-1.66
Assam	0.089	2.57	0.005	0.14	0.075	2.14	-0.016	-0.41
Goa	0.103	2.09	0.125	2.63	0.123	2.47	0.151	3.12
Himachal Pradesh	0.047	1.76	-0.033	-1.10	0.051	1.92	-0.031	-1.05
Jammu and Kashmir	-0.027	-1.08	-0.150	-4.42	-0.034	-1.35	-0.164	-4.80
Manipur	0.100	2.88	-0.085	-1.73	0.082	2.29	-0.115	-2.30
Meghalaya	0.046	1.37	-0.080	-1.96	0.035	1.04	-0.098	-2.40
Mizoram	0.172	3.96	-0.030	-0.52	0.162	3.72	-0.051	-0.89
Nagaland	0.135	3.94	-0.051	-1.04	0.123	3.55	-0.074	-1.50
Sikkim	0.254	4.63	0.096	1.58	0.258	4.73	0.095	1.57
Tripura	0.129	4.21	-0.020	-0.50	0.115	3.69	-0.044	-1.05

Model 6 of Table 5 is an alternative specification of Model 4 in Table 4. It allows the transfer variable to interact with State dummies. The parameter of road length variable is positive and significant at 10 percent level. The λ value increased further to 0.319. In all 18 General Category States, the effect of transfers on growth is positive and

significant at 5 percent or 10 percent level, except in Bihar and West Bengal. In Special Category States, the results are more or less the same as in Model 5.

Table 5: One-way Fixed Effects Model Results With Transfers Interaction

Variables	Model 5		Model 6	
	Coefficient	t-ratio	Coefficient	t-ratio
Constant (γ_1)	0.975	3.18	1.667	5.00
Ln Per Capita Income$_{t-1}$ (γ_2)	-0.299	-9.85	-0.376	-11.11
Ln Road Length ($\gamma_{4)}$	0.029	1.66	0.032	1.89
Ln Per Capita Power Availability($\gamma_{5)}$	0.142	5.19	0.135	5.08
Post Crisis Period Dummy (γ_6)			0.040	4.63
R Square	0.347		0.385	
Hausman Statistics	41.65		58.04	
General Category States				
Andhra Pradesh* Ln Per Capita Transfers	0.137	4.27	0.155	4.95
Bihar* Ln Per Capita Transfers	0.048	0.79	0.079	1.33
Chattisgarh* Ln Per Capita Transfers	0.114	3.19	0.141	4.00
Gujarat * Ln Per Capita Transfers	0.165	3.89	0.206	4.87
Haryana * Ln Per Capita Transfers	0.127	2.71	0.151	3.29
Jharkhand* Ln Per Capita Transfers	0.072	1.79	0.075	1.93
Karnataka *Ln Per Capita Transfers	0.166	4.03	0.193	4.77
Kerala * Ln Per Capita Transfers	0.103	2.71	0.125	3.35
Madhya Pradesh* Ln Per Capita Transfers	0.097	2.47	0.114	2.99
Maharashtra * Ln Per Capita Transfers	0.089	2.19	0.109	2.75
Orissa * Ln Per Capita Transfers	0.153	3.91	0.174	4.55
Punjab * Ln Per Capita Transfers	0.065	1.82	0.072	2.07
Rajasthan * Ln Per Capita Transfers	0.094	2.16	0.119	2.78
Tamil Nadu * Ln Per Capita Transfers	0.122	2.64	0.160	3.49
Telangana* Ln Per Capita Transfers	0.146	2.54	0.192	3.37
Uttar Pradesh* Ln Per Capita Transfers	0.077	1.65	0.086	1.90
Uttarakhand*Ln Per Capita Transfers	0.157	2.44	0.221	3.45

Variables	Model 5		Model 6	
	Coefficient	t-ratio	Coefficient	t-ratio
West Bengal * Ln Per Capita Transfers	0.057	1.44	0.062	1.61
Special Category States				
Arunachal Pradesh * Ln Per Capita Transfers	-0.018	-0.33	-0.007	-0.14
Assam * Ln Per Capita Transfers	0.140	2.51	0.153	2.83
Goa * Ln Per Capita Transfers	0.101	4.27	0.109	4.75
Himachal Pradesh * Ln Per Capita Transfers	0.154	3.03	0.184	3.70
Jammu and Kashmir* Ln Per Capita Transfers	0.083	0.97	0.074	0.89
Manipur * Ln Per Capita Transfers	0.103	1.24	0.068	0.83
Meghalaya* Ln Per Capita Transfers	0.036	0.71	0.013	0.26
Mizoram* Ln Per Capita Transfers	0.219	4.25	0.264	5.19
Nagaland * Ln Per Capita Transfers	0.056	0.89	0.065	1.05
Sikkim * Ln Per Capita Transfers	0.379	4.84	0.463	5.92
Tripura* Ln Per Capita Transfers	0.308	4.34	0.349	5.02

Note: State Dummies included but their Coefficients are not shown.

(ii) General Category States Results: Table 6 reports the one-way fixed effects growth convergence model results for General Category States. In Model 1, the initial per capita income is negatively and significantly related to the growth. The speed of convergence, λ is 0.0926, indicating that any General Category State on an average reduces 9.3 percent of the gap between its steady state income and initial income every year. The per capita power availability has a positive and significant effect on growth. Road length also has a positive effect, but not significant. In Model 2, as expected the per capita transfer positively and significantly influences the growth and increases the magnitude of λ to 0.151. These results imply that the fiscal transfers policy contribute significantly to the income convergence of General Category States in India.

Table 6: Panel Conditional Convergence: One-way Fixed Effects Model Results for General Category States

Variables	Model 1		Model 2		Model 3		Model 4	
	Coeffi-cient	t-ratio	Coeffi-cient	t-ratio	Coeffi-cient	t-ratio	Coeffi-cient	t-ratio
Constant (γ_1)	0.530	5.05	0.901	7.75	0.561	3.64	1.185	6.84
Ln Per Capita Income$_{t-1}$ (γ_2)	-0.097	-4.88	-0.163	-7.52	-0.100	-4.46	-0.192	-7.60
Ln Per Capita Transfers (γ_3)			0.078	5.91			0.087	6.35
Ln Road Length (γ_4)	0.006	0.51	-0.007	-0.67	0.005	0.50	-0.010	-0.93
Ln Per Capita Power Availability (γ_5)	0.081	3.65	0.062	2.98	0.081	3.65	0.061	2.95
Post Crisis Period Dummy (γ_6)					0.002	0.28	0.016	2.20
R Square	0.227		0.329		0.227		0.343	
Hausman Statistics	27.88		37.01		20.94		69.55	
N	252		252		252		252	
State Dummies (Individual Effects)								
Andhra Pradesh								
Bihar	0.025	0.88	-0.093	-2.78	0.022	0.71	-0.133	-3.52
Chattisgarh	0.000	0.01	-0.040	-2.60	0.000	-0.02	-0.048	-3.08
Gujarat	0.014	1.03	0.072	4.49	0.015	1.06	0.084	5.01
Haryana	0.016	0.75	0.075	3.30	0.017	0.78	0.088	3.80
Jharkhand	0.064	2.06	-0.019	-0.59	0.062	1.96	-0.042	-1.24
Karnataka	0.039	2.58	0.072	4.75	0.040	2.58	0.082	5.24
Kerala	0.071	3.36	0.100	4.94	0.072	3.35	0.111	5.37
Madhya Pradesh	-0.036	-2.24	-0.077	-4.69	-0.037	-2.20	-0.094	-5.21
Maharashtra	0.023	1.50	0.098	5.11	0.024	1.52	0.116	5.61
Orissa	0.010	0.60	-0.039	-2.27	0.009	0.55	-0.051	-2.84
Punjab	-0.037	-2.08	0.012	0.64	-0.036	-2.05	0.021	1.11
Rajasthan	-0.014	-1.05	-0.025	-1.95	-0.015	-1.07	-0.031	-2.37
Tamil Nadu	0.019	1.51	0.060	4.35	0.020	1.53	0.070	4.86
Telangana	0.032	2.31	0.054	4.02	0.033	2.32	0.060	4.42
Uttar Pradesh	-0.020	-0.93	-0.067	-3.08	-0.022	-0.97	-0.088	-3.71
Uttarakhand	0.057	2.87	0.012	0.62	0.058	2.88	0.012	0.61
West Bengal	0.012	0.61	-0.006	-0.33	0.011	0.57	-0.014	-0.74

In Model 3, while the post global crisis period dummy has a positive coefficient, it is not significant, indicating that the average growth of General Category States remains the same in the pre and post global crisis periods. As transfer is excluded, the λ value is 0.095. When the transfer variable is included in Model 4, the λ value increases to 0.176. This result confirms that the fiscal transfer policy contributes to the growth convergence of General Category States. Further the post crisis dummy turns out be significant.

Table 7 reports the one way random effects estimation results of Model 5 and Model 6 which allow the interaction of fiscal transfer variable with State dummies. The interaction terms boost the λ value to 0.155 and 0.183 in respective models. Interestingly in both cases, the effect of transfers on growth is positive and statistically significant in all General Category States, including Bihar and West Bengal.

Table 7: One-way Random Effects Model Results For General Category States With Transfers Interaction

Variables	Model 5		Model 6	
	Coefficient	t-ratio	Coefficient	t-ratio
Constant (γ_1)	0.915	7.87	1.208	6.94
Ln Per Capita Income$_{t-1}$ (γ_2)	-0.168	-7.73	-0.201	-7.73
Ln Road Length ($\gamma_{4)}$	-0.005	-0.56	-0.008	-0.78
Ln Per Capita Power Availability ($\gamma_{5)}$	0.070	3.57	0.071	3.65
Post Crisis Period Dummy (γ_6)			0.017	2.25
R Square	0.327		0.342	
Hausman Statistics	12.25		15.58	
N	252		252	
Andhra Pradesh* Ln Per Capita Transfers	0.075	5.78	0.085	6.24
Bihar* Ln Per Capita Transfers	0.065	5.87	0.069	6.23
Chattisgarh* Ln Per Capita Transfers	0.071	5.76	0.079	6.21
Gujarat *Ln Per Capita Transfers	0.084	5.89	0.095	6.35
Haryana * Ln Per Capita Transfers	0.085	5.85	0.096	6.32
Jharkhand* Ln Per Capita Transfers	0.074	6.25	0.081	6.67
Karnataka * Ln Per Capita Transfers	0.084	6.12	0.095	6.57
Kerala * Ln Per Capita Transfers	0.088	6.37	0.099	6.81
Madhya Pradesh* Ln Per Capita Transfers	0.066	5.38	0.073	5.82
Maharashtra * Ln Per Capita Transfers	0.087	5.97	0.099	6.43
Orissa * Ln Per Capita Transfers	0.071	5.85	0.079	6.30
Punjab * Ln Per Capita Transfers	0.076	5.40	0.087	5.88
Rajasthan * Ln Per Capita Transfers	0.072	5.62	0.081	6.08
Tamil Nadu * Ln Per Capita Transfers	0.082	5.94	0.093	6.40
Telangana* Ln Per Capita Transfers	0.082	6.05	0.092	6.51
Uttar Pradesh* Ln Per Capita Transfers	0.067	5.49	0.074	5.92
Uttarakhand* Ln Per Capita Transfers	0.077	6.24	0.087	6.68
West Bengal * Ln Per Capita Transfers	0.075	5.85	0.083	6.29

(iii) Special Category States Results: Table 8 presents the one way fixed effects estimation results for Special Category States. As expected, in Model 1, the initial per capita income has a negative and significant coefficient. It provides the speed of convergence of 0.163, which is higher than the convergence rate of 0.093 for the General Category States.

Table 8: Panel Conditional Convergence: One-way Fixed Effects Model Results for Special Category States

Variables	Model 1		Model 2		Model 3		Model 4	
	Coeffi-cient	t-ratio	Coeffi-cient	t-ratio	Coeffi-cient	t-ratio	Coeffi-cient	t-ratio
Constant (γ_1)	0.833	3.2	0.683	2.62	1.259	3.69	1.040	2.99
Ln Per Capita Income$_{t-1}$ (γ_2)	-0.177	-4.05	-0.226	-4.85	-0.205	-4.48	-0.244	-5.10
Ln Per Capita Transfers (γ_3)			0.084	2.66			0.077	2.40
Ln Road Length (γ_4)	0.037	1.35	0.030	1.10	0.032	1.17	0.026	0.97
Ln Power Availability (γ_5)	0.141	3.57	0.121	3.06	0.127	3.19	0.111	2.81
Post Crisis Period Dummy (γ_6)					0.034	1.90	0.028	1.54
R Square	0.215		0.253		0.235		0.266	
Hausman Statistics	22.92		29.33		25.97		31.35	
N	154		154		154		154	
State Specific Fixed Effects								
Arunachal Pradesh								
Assam	-0.096	-1.1	0.043	0.42	-0.107	-1.23	0.022	0.22
Goa	-0.014	-0.18	0.217	1.89	0.041	0.50	0.240	2.08
Himachal Pradesh	-0.113	-2.47	0.018	0.27	-0.086	-1.81	0.028	0.42
Jammu and Kashmir	-0.201	-3.65	-0.109	-1.70	-0.192	-3.53	-0.111	-1.74
Manipur	-0.041	-1.32	-0.013	-0.40	-0.063	-1.93	-0.033	-0.97
Meghalaya	-0.096	-2.59	-0.007	-0.15	-0.102	-2.75	-0.019	-0.39
Mizoram	0.056	1.57	0.058	1.67	0.047	1.32	0.051	1.45
Nagaland	-0.006	-0.18	0.017	0.53	-0.016	-0.53	0.006	0.19
Sikkim	0.163	2.51	0.203	3.11	0.180	2.77	0.213	3.26
Tripura	-0.021	-0.61	0.044	1.04	-0.034	-0.96	0.028	0.65

In Model 2, there is a positive and significant association between per capita transfer and growth of Special Category States. Inclusion of transfer increases the speed of convergence rate to 0.204 from 0.163 in Model 1. Thus, the fiscal transfers policy contributes significantly to the income convergence of Special Category States in India.

In Model 3, while the post global crisis period dummy has a positive coefficient, it is significant only at 10 percent level. The λ value is 0.186. With the transfer variable, the λ value increases to 0.218 in Model 4. As transfer variable positively and significantly influence growth, we can infer that the fiscal transfer policy contributes to the growth convergence of Special Category States.

Table 9: One-way Fixed Effects Model Results For Special Category States With Transfers Interaction

Variables	Model 5		Model 6	
	Coefficient	t-ratio	Coefficient	t-ratio
Constant (γ_1)	3.529	4.21	4.132	4.86
Ln Per Capita Income$_{t-1}$ (γ_2)	-0.451	-7.25	-0.497	-7.85
Ln Road Length ($\gamma_{4)}$	0.066	1.95	0.066	1.99
Ln Per Capita Power Availability ($\gamma_{5)}$	0.181	3.87	0.168	3.64
Post Crisis Period Dummy (γ_6)			0.047	2.64
R Square	0.389		0.421	
Hausman Statistics	27.67		32.79	
N	154		154	
Arunachal Pradesh * Ln Per Capita Transfers	-0.014	-0.18	-0.018	-0.23
Assam * Ln Per Capita Transfers	0.192	2.41	0.182	2.33
Goa * Ln Per Capita Transfers	0.131	3.84	0.127	3.82
Himachal Pradesh * Ln Per Capita Transfers	0.233	3.14	0.237	3.26
Jammu and Kashmir* Ln Per Capita Transfers	0.083	0.69	0.052	0.44
Manipur * Ln Per Capita Transfers	0.146	1.28	0.080	0.69
Meghalaya* Ln Per Capita Transfers	0.058	0.78	0.014	0.18
Mizoram* Ln Per Capita Transfers	0.337	4.14	0.346	4.34
Nagaland * Ln Per Capita Transfers	0.118	1.29	0.097	1.08
Sikkim * Ln Per Capita Transfers	0.550	4.18	0.573	4.44
Tripura* Ln Per Capita Transfers	0.452	4.10	0.448	4.16

Table 9 shows the one way fixed effects estimation results of Model 5 and Model 6 for SGC. These models allow the interaction of fiscal transfer variable with State dummies. Road length, per capita power availability and post crisis period dummy have positive and significant effect on growth. The fiscal transfers influence growth positively and significantly in Assam, Goa, Himachal Pradesh, Mizoram, Sikkim and Tripura. In all other Special Category States, the effect of fiscal transfers on growth is not significant. In Model 5 and Model 6, the λ value improved to 0.372 and 0.403 respectively.

SUMMARY AND CONCLUSION

In this study an attempt has been made to empirically analyze the effect of fiscal transfers on the growth of 29 Indian States and on regional income convergence during 2005 to 2019. The empirical results indicate the σ convergence of per capita transfers and not of per capita income. However, they provide a strong evidence for the conditional convergence in per capita income. Interestingly the fiscal transfers contributed significantly to the growth of almost all State economies, except Bihar,

West Bengal, Arunachal Pradesh, Jammu and Kashmir, Manipur, Meghalaya, and Nagaland. Further, they contributed significantly to the income convergence across Indian States. The regional gaps in per capita incomes were narrowing at a rate of 17.7-31.9 percent per annum. However, if there were no transfers, the narrowing rate would have been only 12.8-14.3 percent.

The results of split sample analyses also confirm the income growth convergence across General Category States and also across the Special Category States, providing evidence for "Club Convergence" in India. The rate of speed of convergence of Special Category States is higher than that of General Category States. The fiscal transfer policy significantly increases the income growth of all General Category States including Bihar and West Bengal while it significantly increases the income growth of 6 Special Category States-Assam, Goa, Himachal Pradesh, Mizoram, Sikkim and Tripura. The results indicate that the fiscal transfer policy contributed significantly to the growth convergence of General Category States as well as Special Category States. With contribution of fiscal transfer policy, the per capita income gap of General Category States reduces at 15.1-18.3 percent per annum. Otherwise, the convergence rate for General Category States would have been only 9.3-9.5 percent. The per capita income convergence rate of Special Category States ranges between 20.4 percent and 40.3 percent with transfers. Otherwise, it would have been ranged between 16.3 percent and 18.6 percent.

In full sample as we all as split sample analyses, the per capita power availability is positively and significantly related to growth. The road length has also positive effect on growth, but it is not significant. The average income growth was higher in post financial crisis period than that in pre-crisis period.

The policy implications emerged from the analyses of study are as follows: (i) While the β convergence happens across Indian States

and it is only necessary condition but not sufficient condition for σ convergence, policy intervention is required to ensure the σ convergence; (ii) Although the average real per capita income and the average real per capita Central transfers of Special Category States are higher than that of General Category States, their average growth rate is still lower than General Category States. This means that they need more policy support; (iii) As the fiscal transfers are not contributing to the income growth of Bihar, West Bengal, Arunachal Pradesh, Jammu and Kashmir, Manipur, Meghalaya, and Nagaland, the Central Government needs to provide more grants to them to boost their growth; (iv) As fiscal transfers policy contributes significantly to the income convergence, this policy instrument need to be effectively designed to speed up the convergence process to achieve equity across India States.

To our knowledge, this is the first empirical study to show the positive and significant effect of fiscal transfer policy on income growth and income convergence of General Category Special Category States in India. One of major limitations of the study is that while it analyzes how fiscal policy affects growth in each of 29 States, it provides only one or common convergence rate for all States. Information on State specific convergence rate may be useful for policy makers. Despite this limitation, we hope that that the findings of this study are useful to policy makers, international agencies and others researchers to take appropriate strategies to design the fiscal transfers policy such that can speed up the regional growth convergence in India.

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