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Spatial Convergence in Public Expenditure across Indian States: Implication of Federal Transfers

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Abstract

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Keywords: India, public expenditure, convergence, federal transfers, spatial econometrics, political economy.

JEL Code: C23, H72, H77, R12

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1. Introduction

Public expenditure has been established as one of the key drivers of economic growth in an economy (Devarajan et al. 1996; Kneller et al. 1999; Bleaney et al. 2001; Bose et al. 2007 etc.). In the context of a globalized world where the goal of achieving Millennium Development Goals (MDG) acquires a primary place, the importance of education and health expenditure can particularly be highlighted. These expenditure and its categories have been studied not only for their impact on growth but also for their impact on poverty reduction. Some studies in this context are Jha. et al. (2001); Warr (2003); Lofgren & Robinson (2004); and Gupta et al. (2008) etc. Looking at this contribution of public expenditure in economic growth and development, it is very important to study its own pattern and growth. It presumes as much importance as studying any other factor. A developing country like India, with vast disparities in economic well-being across its large geographical area needs particular attention. Kalirajan and Otsuka (2012) charted out disparities in development indicators across Indian sub-national governments. Although human development indicators improved over the years, disparities existed. Life expectancy at birth improved from 60.2 in 1983 to 63 in 2003, literacy rate improved from 32.8% in 1971 to 64.2% in 2002, and similarly infant mortality rate declined from 121 (per thousand) in 1971 to 62 (per thousand) in 2006. The coefficient of variation declined for first two categories but increased for the third. With an aim to reduce these disparities, public expenditure can be considered as primary contributing factor. Therefore the present study seeks to chart out disparities in per-capita expenditure at sub-national level in India. The goal is to analyse whether these disparities have declined over time equalising the level of per-capita expenditure across states, which could further help to reduce disparities in public services.

In order to analyse the disparities in level of per-capita expenditure we resort to the approach of convergence in per-capita expenditure. Only few studies have examined this question empirically. Only one study by Mohanty (2011) can be found in Indian context. The goal of present study is then to fill this gap by empirically examining the evidence for expenditure convergence across Indian sub-national governments.

It is important to note that India is a quasi-federal and decentralized economy where the constitution specifies the provision of federal transfers to state government to support their expenditure requirements. The normative view on fiscal federalism suggests that intergovernmental transfers should be aligned with the objective of equity and efficiency to ensure even distribution of basic public services across regions (Oates 1972; and Gramlich 1977). On the contrary, several studies have found the impact of political environment such as partisan effect, lobbying power of sub-national governments in central government etc. on the horizontal devolution of federal transfers leading to conclusion that distribution of inter-governmental transfers deviates from the normative theory (Grossman 1992; Porto and Sanguinetti 2001; Johansson 2003; Olle and Navarro 2008; Banful 2010; Calderia 2012). Some evidence can be found in Indian context as well (Singh and Vashishtha 2004; Biswas et. al. 2010; Arulampalam et. al. 2008; and Khemani 2007).

Due to various channels of distribution such as Planning Commission (PC), Finance Commission (FC), and various ministries, a unique devolution method is not followed for all categories of federal transfers. Some categories are distributed according to a composite formula which is designed with weights assigned to variables such as population, tax effort, fiscal discipline etc. The example of such criteria can be a composite formula defined by FC and Gadgil Formula adopted by PC.[1] Some of the transfer categories are considered to be discretionary as these are not devolved as per any well-defined criteria and literature suggests political interference in their devolution. Different ways of distribution and literature on political economy of federal transfers indicate that all transfers categories would not have similar impact on expenditure growth. In order to estimate this, federal transfers are categorised into two categories: formula and discretionary transfers, defined as per the mode of their horizontal distribution. We test the following hypotheses on the impact of aggregate and various categories of inter-governmental transfers on public expenditure,.

(a) To find evidence or lack of convergence in aggregate expenditure and its three categories such as development, education and health expenditure. Null hypothesis is as follows:
 H_1*: *Per-capita real expenditure and its three categories are not converging.

(b) Due to uneven distribution of federal transfers, poorer states are supported more than richer ones. Transfers contribute as much as 68% of total revenue of Bihar, followed by Orissa (48%) (Table 2). Therefore the federal transfers could help eliminating disparities in public expenditure in decentralized economies and providing similar level of public

[1] (See Appendices 1 & 2 for detail).

goods and services to its citizens across all regions. Therefore it is necessary to study how transfers have impacted disparities and convergence in expenditure levels. We test the following null hypothesis:

***H_2*:** *Federal transfers have not assisted the convergence in public expenditure.*

(c) On the basis of different distribution criterion for formula and discretionary transfers, the following hypothesis is tested:

***H_3*:** *Formula transfers that are distributed based on a well-defined formula, have same effect on expenditure growth as that of discretionary transfers.*

This paper contributes to the literature in several ways. First, a comprehensive view on expenditure convergence across sub-national governments is provided. Second, not only the effect of total federal transfers but also the impact of formula and discretionary transfers on expenditure growth is explained. Thirdly, we control for spatial interaction among states as a potential explanation for their expenditure growth. We mention our findings here in brief. Convergence analysis indicates equalisation in level of per-capita expenditure. Inter-governmental transfers, with a positive and significant impact on expenditure growth have augmented the speed of convergence. Formula transfers are found to have higher effect on expenditure growth than that of discretionary transfers. There is evidence of spatial spill-overs in determining the growth of total expenditure and its categories across Indian States.

In accordance with our objective we proceed as follows. Section 2 presents literature on expenditure convergence and on spatial interaction among different states. The disparities in public expenditure across Indian states are described in section 3. Section 4 defines methodology and specifies the unconditional and conditional convergence using Solow (1956) growth model. The detail of variables is provided in section 5. Section 6 presents the results for aggregate expenditure and its various categories. Section 7 discusses the robustness of results with various model estimations. Section 8 concludes.

2. Literature on Expenditure Convergence

Alongside growth impact of government expenditure, another important debates emerging in literature is on the convergence of public expenditure across economies. The basic structure of income convergence hypothesis can be found in Solow (1956). The diminishing marginal returns to capital lead the poorer economies to catch up with the richer ones. In other words, states with relatively lower real per-capita income grow more rapidly than states with higher level of real per-capita income. Annala (2003) and Coughlin (2007) explain that with a constant tax to output ratio which is used to finance expenditure Solow (1956) model implies convergence in fiscal policy variables along with convergence in output. Further, Skidmore et al. (2004) explain that analogous to diminishing marginal returns to capital on the production side, diminishing marginal utility in the consumption of public goods and services on the demand side will ensure convergence in public expenditure. Citizens residing in countries with lower provisions of government goods and services will receive higher returns from additional government spending rather than citizens in countries with already high levels of government provisions. As a result citizens in the former countries will have more willingness to pay for additional government goods and services than citizens in the latter countries. This could lead countries with less government expenditure to increase their expenditure more than the countries with high level of government expenditure. Hence convergence in public expenditure could take place. Skidmore and Deller (2008) postulate federal transfers as another contributing factor towards expenditure convergence. This applies in an economic set up where financial aid is provided more to poorer communities than riches ones to strengthen the spending power of the former. Further a study by Scully (1991) demonstrates how fiscal regimes across economies converge when there is convergence in income. Based on the assumption that voter preferences for public income transfers are similar across economies, migration could to convergence in fiscal policy.

There is some empirical evidence on convergence in public expenditure across European Union countries. Scully (1991) found that convergence in income level and income distribution leads to convergence in fiscal regimes. Afexentiou and Serletis (1996) studied the convergence in expenditure, transfers and subsidies across European Union (EU). Authors found evidence against convergence except for few cases. Annala (2003) has studied convergence in various expenditure and taxation categories, and income level across U.S. states and compared their speed of convergence. Author found that local and state tax policies have become alike in U.S. over the period of 1977 to 1996 with similar speed of convergence. Only one category of public expenditure i.e. expenditure on Health and Hospitals did not show evidence for convergence. Skidmore and Deller (2008) examined the evidence for convergence in various categories of municipal expenditure in Wisconsin for the period of 1990-2000. Their results have confirmed the convergence in total expenditure and its various categories.

As per the recommendations of EU institutions to increase productive expenditure vis-à-vis unproductive expenditure, some studies focused on convergence in composition of public expenditure. Sanz and Velazquez (2004) studied convergence in structure of public expenditure across OECD countries. Authors found strong divergence. Ferreiro et al. (2013) found no generalized increase or convergence in productive expenditure across EU countries. In a similar paper Apergis et al. (2013) found no convergence in composition of total expenditure, EU countries were converging with respect to the magnitude of their total expenditure.

2.1. Spatial Interaction among Jurisdictions

Taking ahead the literature on expenditure convergence, yardstick competition among economies is also labelled as one potential driving force towards expenditure convergence. Skidmore and Deller (2008) propose inclusion of this aspect as an important avenue for future research. One study by Coughlin et al. (2007) examined fiscal policy convergence across U.S. states in spatial econometric framework. Authors found presence of expenditure convergence and significant impact of spatial proximity to economically and demographically similar states.

This strand of literature suggests that decisions of determining fiscal policy variable such as public expenditure, is not undertaken in isolation from other neighbouring jurisdictions. Large evidence is found on strategic interaction among jurisdictions, explained by spatial spill-overs which extend beyond borders of a jurisdiction to effect fiscal behaviour of other jurisdictions. Case et al. (1993), one of the pioneering studies in this area, suggest that public expenditure of a state in USA is significantly affected by expenditure of neighbouring states. This phenomenon has been explained by several possible reasons. Besley and Case (1995) explain the yardstick competition as one of the reasons of spill-overs across different jurisdictions. Due to imperfect information, voters judge the effectiveness of their own politicians by observing the performance of politicians in neighbouring jurisdictions. Therefore politicians, due to fear of losing in next electoral term, will take fiscal policy decisions of the neighbouring states in to considerations. Several other factors have been considered as possible reasons of spill-over in public expenditure such as: inter-state mobility (Baicker 2005); spread of negative externality in case of increasing public expenditure on Police Services (Kelejian and Robinson 1993); occurrence of common shocks to fiscal policy (Revelli 2002); mimicking behaviour of states (Stastna 2009). On the contrary, Revelli (2003) finds that, considering vertical expenditure externalities among upper- and lower-tier authorities explicitly into the model reduces the magnitude of estimated between-districts interaction.

Drawing form this literature, we analyse expenditure convergence in spatial context. A measure of geographical proximity of sub-national governments is considered. This is used to construct spatially weighted per-capita real expenditure growth (in respective category) of all other states, which is included as one of the determinant of expenditure growth. Rey and Montouri (2000), Anselin (1988, 1993, and 1995) highlight that if spatial dependence is found among economies, then ignoring it can give biased OLS results. Hence the assumption of spatial independence should be relaxed in convergence analysis.

3. Disparities in Expenditure across Sub-National Governments

Due to decentralized set up of Indian economy, large proportion of aggregate expenditure in economy is undertaken at sub-national level (Bagchi 2003; Khemani 2007; Rao and Singh, 2007).[2] It is evident form Table 1 that state governments undertake 48% of total expenditure in the economy (net of transfers). On the other side, revenue collection is approximately 36.7% of aggregate revenue collection.

Table 1: Expenditure and Revenue Decentralization in India 2010-11

	Expenditure	Tax Revenue
Central Government (In Crore)	804864.07	793072
All States (In Crore)	766266.07	460708.9
Total Expenditure	1571130.14	1253781
In Percentage		
Central Government	51.2	63.3
All States	48.8	36.7
Total Expenditure	100	100

Note: Based on Authors' Calculations. (1) All States includes 29 states and 6 UTs. (2) Total Transfers such as states' share in central taxes; Grants and Loans from the Centre are deducted from total expenditure of States and Central Government.

[2] For example sales tax (largest contribution), excise duties on alcoholic products, stamp duties and registration fees, motor vehicle tax, and entertainment tax etc.

Therefore revenue generated at sub-national level is not sufficient to finance their total expenditure liabilities. This also indicates that public expenditure is more decentralized than revenue autonomy.

Table 2 charts out the disparities in public expenditure undertaken by individual state governments. The level of aggregate per-capita expenditure varies from 4187 (Rs.) for Bihar to 13,624 (Rs.) of Haryana in 2010-11. The development expenditure varies from 3264 Rs. to 8996 Rs. The disparities are equally notable in other important expenditure categories as well. Education expenditure varies from 848 Rs. to 2417 Rs.

Table 2: Fiscal Disparities of State Governments (2010-11)

State	Magnitude of Per-capita Expenditure (in Rs.)				Federal Transfers (Net of loan) as Ratio of Total Revenue
	Total Expenditure	Development Expenditure	Education Expenditure	Health Expenditure	
Bihar	4187.6	3264.3	848.3	146.2	0.66
Orissa	8650.9	5531.4	1586.8	254.8	0.46
Uttar Pradesh	6751.5	3740.3	1086.8	256.2	0.41
Madhya Pradesh	8372.8	5025.8	1193.5	264.7	0.40
Rajasthan	7967.2	4927.3	1518.7	309.1	0.33
West Bengal	8183.2	4211.9	1614.6	341.8	0.33
Andhra Pradesh	11919.3	7423.7	1491.5	410.6	0.24
Karnataka	12156.5	8431.6	1895.0	419.5	0.24
Tamil Nadu	13509.1	7852.5	2062.4	553.0	0.21
Kerala	11828.7	5719.5	2011.6	536.1	0.18
Maharashtra	11617.1	7585.5	2417.3	371.9	0.16
Haryana	13624.9	8996.0	2363.5	389.4	0.16
Punjab	12764.4	5462.3	1494.6	382.7	0.15
Gujarat	12198.9	7981.8	1944.2	445.6	0.15
Min	4187.6	3264.3	848.3	146.2	0.1
Max	13624.9	8996.0	2417.3	553.0	0.7

Note: Based on Authors Calculations.
Data Source: RBI (2004, 2010, 2012)

Similarly health expenditure extends from 146 Rs. to 553 Rs. It can also be observed that magnitude of expenditure spent on health services is much lesser than education services in all states. Due to these disparities, one can expect a notable difference in public good provisions across state jurisdictions. With presence of these disparities and lesser spending in relatively poorer states, federal transfers play an important role. The states with inadequate revenue are supported more with federal transfers. Transfers contribute as much as 68% of total revenue of

Bihar, followed by Orissa (48%) (Table A3). This analysis answers this important question whether disparities in level of public expenditure are decreasing over time with states' own effort and with the help of these federal transfers.

4. Methodology

To study convergence empirically, two widely applied approaches are - β and sigma convergence, initiated by Baumol (1986) and Barro and Sala-i-Martin (1992). First approach is regression approach where growth of real expenditure is regressed upon its initial level. In the econometric formulation of unconditional β-convergence no other economy specific characteristic is introduced into the equation.

$$\ln\left(\frac{y_{i,T}}{y_{i,0}}\right) = \alpha + \beta_0 \ln(y_{i,0}) + \varepsilon_{it} \dots\dots\dots\dots\dots\dots. (1)$$

Where $y_{i,T}$ is the per-capita real expenditure of state 'i' at time 't', $y_{i,0}$ is the per-capita real expenditure of state 'i' at time zero, which refers to the initial level of per-capita expenditure. Therefore term on left hand side refers to the growth rate in per-capita real expenditure. In this study we use Y of one period lag as initial value; therefore, annual growth rate of Y is taken as dependent variable. T is the period length, α is constant and β_0 is the convergence coefficient. Negative coefficient of initial level of expenditure i.e. $\beta_0 < 0$ indicates the occurrence of convergence. Higher the initial level of real per-capita expenditure, lower is the growth rate of expenditure and vice-versa.

On the other hand convergence in conditional sense implies that economies differ with respect to their steady state path. Farther an economy from its own steady state path, faster it will grow. The equation for conditional convergence is defined as below:

$$\ln\left(\frac{y_{i,T}}{y_{i,0}}\right) = \alpha + \beta_0 \ln(y_{i,0}) + \beta_1(X_i) + \varepsilon_{it} \dots\dots\dots\dots\dots. (2)$$

Where X_i added to first equation which refers to the state specific characteristics, potential determinants of expenditure growth. β_1 is the vector of associated coefficients. These equations indicate convergence if coefficient β_0 is negative and statistically significant. One of pioneering studies to investigate absolute and conditional convergence across countries is Mankiw, Romer and Weil (1992). Authors have analysed conditional convergence by including saving rate and population growth rate in the regression equation and further included human capital as factor of production and found conditional convergence across countries.

The second approach is sigma convergence. This approach focuses on the trend in standard deviation in per-capita expenditure across economies. Quah (1993) states that decline in standard deviation over the years is a direct indicator of convergence i.e. equality in per-capita income. Evidence for β-convergence i.e. $\beta < 0$ does not imply occurrence of sigma-convergence. Even if poorer economies grow faster than richer ones, it may not indicate decline in dispersion. Therefore β-convergence is necessary condition but not the sufficient condition for occurrence of sigma-convergence (Barro and Martin 1995).

4.1 Adding Spatial Dimension to Convergence Model

As mentioned earlier, guided by literature on strategic interaction among different jurisdictions, we generate spatial weighted average of expenditure growth to be included as one independent variable. An estimate of spatial autocorrelation using Moran's I statistics indicates the presence of spatial dependence. This is defined below:

$$I = \frac{N \ \sum_i \sum_j W_{ij}(X_i - \bar{X})(X_j - X)}{\sum_i \ \sum_j W_{ij}(X_i - \bar{X})^2}$$

Here X_i refers to per-capita real expenditure of state i, $\bar{X}$ denotes its average value over all states, W_{ij} is the spatial weight between i_{th} and j_{th} state. These spatial weights together form a spatial weight matrix, which indicates the geographical proximity among all states. As per literature there are several ways to generate spatial weights. First way to define spatial proximity is to consider neighbourhood status. The spatial weight takes value 1 if two states share geographical boundaries, and zero otherwise. Second, a measure of border sharing (in length or kms.) is taken into account. The limitation of these two spatial matrices is that these take into account only neighbouring states and leave the rest. Third way is to consider geographical distance between states as measure of proximity, defined as the inverse distance between centroid of two states. Distance of a state from itself is taken as zero. So each diagonal element in the matrix takes value zero. The idea of taking inverse of each element of the matrix is to give more weightage to geographical closer states and lesser weightage to farther states. As per this notion, the farthest state gets the least weightage. This method takes into account all the states. All three methods are equally used in the literature. To check robustness of results in this study, spatial matrix is defined as per neighbourhood status and distance between states, which are suitable for objective of this study.

The results of Moran's I statistics showed positive and significant spatial spill-overs (Table A3). Additionally, spatial graphs of expenditure categories (figure A1 – A4) also represent the clusters in each category of real per-capita expenditure. These indicate that higher spending states are surrounded by higher spending states and vice-versa. These results have been confirmed in all expenditure categories. Several ways have been specified in literature to model these spatial effects. First, spatial interaction can be modelled using *Spatial Lag Model* where dependent variable, Y in state *i* is related with Y of all other states. Spatial effect is captured via weighted dependent variable which answers the question that how growth rate of per-capita real expenditure in a state is related with growth rate of per-capita real expenditure of other states, nearer or farther, conditioned on its own initial level of expenditure and other state specific characteristics. In this set up the β-convergence model can be defined in the following way:

$$\ln\left(\frac{y_{i,T}}{y_{i,T-\tau}}\right) = \alpha + \beta_0 \ln\left(y_{i,T-\tau}\right) + \beta_1\left(X_{i,T}\right) + \rho W \ln\left(\frac{y_{i,T}}{y_{i,T-\tau}}\right) + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots (3)$$

$$\varepsilon \sim N(0, \sigma^2 I)$$

Here *W* is spatial weight matrix as mentioned above, *I* represents the identity matrix. Errors are distributed normally with zero mean and constant variance. ρ (rho) is the spatial autoregressive parameter. $\rho = 0$ indicates no spatial dependence and model becomes suitable for application of classical ordinary least square. A positive and significant value of ρ signifies positive spatial spill-overs across geographic neighbourhood of states. This specification encounters the estimation problem with ordinary least square due to simultaneity bias. Because Y of state *i* at time *t* is endogenous variables and also dependent on Y of state *j* at time *t*, which in turn is determined at the same time. Therefore simultaneity bias occurs due to weighted dependent variable on right hand side. These models are estimated using maximum likelihood estimation technique.

Second way to incorporate spatial effect is via error term ε rather than through a systematic component such as dependent variable itself. This type of model is known as *Spatial Error Model*. It examines some spatially clustered feature which is omitted from the model but reflected in the error term. The model specification is as follows:

$$\ln\left(\frac{y_{i,T}}{y_{i,T-\tau}}\right) = \alpha + \beta_0 \ln(y_{i,T-\tau}) + \beta_1(X_{i,T}) + \varepsilon_{it} \quad \dots\dots\dots\dots\dots(4)$$

$$\varepsilon_{it} = \lambda W \varepsilon_{it} + \mu_{it}, \text{ where } \mu \sim N(0, \sigma^2 I)$$

Here error term is divided into two parts. One part exhibits spatial pattern and the other is spatially uncorrelated error term. The parameter λ (lambda) measures the extent to which error in state *i* is related with error term of other states. The errors are positively correlated if λ>0 and vice-versa. Therefore presence of clustered errors violates the OLS assumption of independent errors. The approach of maximum likelihood function is used to estimate this model as well. If the data does not exhibit any spatially pattern either in spatial lag term or in spatial error term i.e. ρ = λ = 0, then spatial models are equivalent to the standard OLS model. Both of these models are applied in this study to check robustness of results.

5. Data and Variables

All Indian states are divided into special and general category states.[3] From general category states we remove three states namely Jharkhand, Chhattisgarh and Goa due to unavailability of certain information. Hence we proceed with remaining 14 states over the period of 1991-92 to 2010-11. The dependent variable in this study is the annual growth in per-capita real expenditure in each category. Primary independent variable of interest is the *initial value*, which is the first lag of per-capita expenditure (in each category). Negative value of its coefficient indicates the presence of convergence.

[3] Transfers in the form of aggregate plan assistance to states include a mix of ratio of loans and grants and this ratio is different for special category states and general category states. While loans constituted 70% and grants 30% for general category states, grants were 90% and loans were 10% for special category states. During the construction of Gadgil formula, a certain amount, approximately 11% was given to three states: Assam, J&K and Nagaland. Gradually more states were added into this list: Himachal Pradesh, Sikkim, Manipur, Meghalaya, Tripura and their share also increased. Since 1980 the share of special category states was pre-determined at 30% and their number increased to 10 states in 1990 with inclusion of Arunachal Pradesh and Mizoram (PC, 2012).

Other variables of interest are real per-capita total transfers (*RPC TTr*), and its two sub-components real per-capita formula transfers (*RPC FTr*) and real per-capita discretionary transfers (*RPC DTr*). The categories covered in formula transfers are transfers for State Plan Schemes and transfers provided by FC in the form of Share in Central Taxes. This part of total transfers can also be referred to as the unconditional grant where the end use of these transfers is not defined. The discretionary category includes Central Plan Schemes (CPS); Centrally Sponsored Schemes (CSS); and Non-Plan Grants (NPG). First two categories are considered as earmarked grants because these are the grants given for specific purpose. Based on our hypotheses, a positive coefficient of total transfer and its categories is expected. Coefficient of formula transfers is expected to higher than that of discretionary transfers.

In order to control for states' overall level of development, *per-capita real GSDP* is controlled in the model. We expect per-capita real GSDP to have positive and significant effect on growth of expenditure. Growth of government expenditure of a state could also be influenced by demographic factors such as growth of its population. Therefore we control *population growth* in the model.

One important aspect of governance is studied with regards to efficacy of public expenditure, where better outcome of public expenditure is associated with better governance (Rajkumar & Swaroop 2002, Gupta et al. 2008). Authors highlight that strengthening governance and improving accountability of public accounts is as important as increasing public spending itself. Therefore we control *law and order index* as a proxy for governance. This variable is used from Garg et al. (2015), a composite index of four variables constructed using Principal Component Analysis (PCA). The variables used are crime rate, value of property recovered as a ratio to property stolen, pendency rate of crimes by courts, and Police strength. Higher the index better is assumed to be the governance inside a state. We expect expenditure to be growing with the higher value of the index.

Alongside contribution of economic factors, the impact of political variables such as election year, voter turnover, electoral competition etc. is also studied on expenditure as well as other components of budget. This section of literature analyses the behaviour of politicians that how they actually use political constraints and opportunities in front of them while framing their fiscal policy. Politicians could manipulate fiscal and monetary policy to pursue several goals such as:

to increase their chances of re-election, to effect perception of voters; to serve more to a favoured section of voters etc. Some studies highlight that proximity to election year has positive impact on public expenditure (Karnik 1990; Vaidya and Sen 1996; Khemani 2004; Chaudhuri and Dasgupta 2005). A study by Uppal (2011) points out an interesting feature that excessive turnover influences allocative efficiency of public expenditure where emphasis shifts from productive towards consumption expenditure. Saez and Sinha (2010) find that political competition increases the investment in education expenditure. Similarly Kashik and Pal (2012) show that larger stronghold of a part in a state is associated with large revenue development expenditure. Based by this literature we include two political variables into our analysis: *Effective Number of Political Parties* (*ENP*); and *Election Year* (*EY*) dummy. The first variable controls for the electoral competition within a state. It is defined on the basis seat share of each party.

$$ENP_S = [\sum_{i \in P} (\frac{S_i}{\sum_{j \in P} S_j})^2]^{-1},$$

where S_i denotes the number of seats won by *i-th* party in that state and *P* is the set of political parties present in that state. Clearly, higher value of '*ENP*' indicates more intense electoral competition. The second variable captures the effect of election year. We consider the dummy variable *'Election Year*' – it takes value 1 (one) if there is election for the Legislative Assembly of a state, and 0 (zero) otherwise.

Table 3: Summary Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Real per-capita Exp (in Rs.)	280	4677.71	1862.88	882.41	9245.92
Real per-capita Development Exp (in Rs.)	280	2651.59	1110.28	463.81	6053.18
Real per-capita Education Exp (in Rs.)	280	701.98	267.78	180.07	1675.61
Real per-capita Health Exp (in Rs.)	280	168.90	58.30	35.08	385.27
Real per-capita Total Transfers (net of Loan) (in Rs.)	280	1059.89	453.42	365.62	2668.57
Real Per-capita Formula Transfer (in Rs.)	280	819.65	373.52	299.34	2108.53
Real per-capita Discretionary Transfer (in Rs.)	280	240.55	122.85	29.33	675.87
Real per-capita GSDP (in Rs.)	280	26038.11	12906.54	4584.43	66199.20
Law and Order Index	280	0.00	1.24	-2.24	4.18
Population Growth	280	0.01	0.02	-0.24	0.04
ENP	280	2.93	1.02	1.41	5.44
Election Year	280	0.20	0.40	0	1

6. Results

Empirical analysis in this study starts with statistical tests of unconditional convergence followed by results for conditional convergence. Robustness of the results is checked by applying different specifications of the model, which varies with respect to the variable inclusion.

β-Convergence

Table 4 reports the unconditional convergence results for total real per-capita expenditure and its categories. Results indicate absence of absolute or unconditional convergence in all categories except health expenditure.

Table 4: Unconditional Convergence: 1991-92 to 2010-11

Dependent Variable: Growth in expenditure category Model: Panel FE	Total Expenditure	Development Expenditure	Education Expenditure	Health Expenditure
Initial Exp Level	0.018	-0.034	0.1663	-0.353**
	[0.783]	[0.723]	[0.180]	[0.011]
Constant	0.057	2.04	-0.179	0.255***
	[0.814]	[0.500]	[0.427]	[0.000]
N	70	70	70	70

Note: (i) Based on Authors' Calculations; Number in parentheses indicates p-value; (ii) Significance levels: *** - p<0.01; ** - p<0.05; and * - p<0.1.

Table 5 reports results for total and development expenditure. Results for education and health expenditure are given in table 6. For each expenditure category in both tables, the first model tests convergence hypothesis without including federal transfers as independent variable. This is extended by controlling for total per-capita real federal transfers (net of loan) in second model. These two models test first and second hypotheses respectively. In order to estimate third hypothesis, model specification is re-estimated replacing total transfers with its categories as defined earlier. Third model includes formula transfers and fourth model includes discretionary transfers. These models test third hypothesis comparing the effect of formula transfers with that of discretionary transfers.

Sign of coefficient of initial expenditure i.e. β-coefficient in each category of expenditure is found to be negative and significantly different from zero (Table 5 and 6, all models). Therefore evidence of conditional convergence holds in each category of expenditure. This evidence leads to rejection of first hypothesis of no convergence in all categories of per-capita expenditure. Adding more independent variables does not alter evidence of conditional convergence. Comparing first model of each expenditure category on the basis of magnitude of β-coefficient, it seems that β-coefficient is least for health expenditure (-0.37) indicating that per-capita real health expenditure is converging faster than other expenditure categories.

Total transfers (net of loan) have positive association with expenditure growth of all categories, which does not seem to be significant for education expenditure (Table 5 and 6, 2nd model). This association is highest for development expenditure (0.19).

Going further to explore implications of transfer categories, the formula transfers are found to have positive association with expenditure growth in all categories. This result is significant for all except education expenditure (Table 5 and 6, 3rd model). At the same time, discretionary transfers also have positive and significant association but with development expenditure only. Other three expenditure categories show insignificant association with discretionary transfers (Table 5 and 6, 4th model). Additionally, the coefficient of discretionary transfers is found to be much smaller than that of formula transfers (Table 5, 4th model). Therefore, these results indicate that formula transfers have larger association with expenditure growth than discretionary transfers.

While studying implications of these two transfer categories on convergence, it seems that negative and significant β-coefficient can be observed in third and fourth model of each expenditure category. Therefore the evidence of convergence still holds when these variables are included in the model specification. While comparing the magnitude of β-coefficient (Model 3rd and 4th, all expenditure categories), formula transfers seem to have higher negative β-coefficient as compared to discretionary transfers in all categories. It indicates that formula transfers have higher contribution in equalising per-capita real expenditure in all categories as compared to discretionary transfers.

Table 5: Spatial Convergence: Total Expenditure and Development Expenditure 1991-92 to 2010-11

Dependent Variable: Growth in expenditure category	Real Per-Capita Total Expenditure				Real Per-Capita Development Expenditure			
	Excluding Transfers	Including Total Transfers (net of loan)	Including Formula Transfers	Including Discretionary Transfers	Excluding Transfers	Including Total Transfers (net of loan)	Including Formula Transfers	Including Discretionary Transfers
	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Initial Total Exp.	-0.26***	-0.29***	-0.30***	-0.25***				
	(0.000)	(0.000)	(0.000)	(0.000)				
Initial Dev. Exp.					-0.33***	-0.46***	-0.44***	-0.37***
					(0.000)	(0.000)	(0.000)	(0.000)
RPC GSDP	0.24***	0.21***	0.19***	0.24***	0.31***	0.20***	0.16***	0.31***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)
RPC TTr		0.06**				0.21***		
		(0.043)				(0.000)		
RPC FTr			0.08***				0.21***	
			(0.00)				(0.000)	
RPC DTr				-0.00				0.04**
				(0.836)				(0.04)
PG	-1.42***	-1.34***	-1.29***	-1.42***	-1.09***	-0.78***	-0.73**	-1.09***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.009)	(0.016)	(0.000)
LOI	0.02*	0.02	0.02	0.02*	0.01	0.004	0.001	0.01
	(0.089)	(0.151)	(0.193)	(0.088)	(0.482)	(0.814)	(0.929)	(0.482)
ENP	-0.003	0.00	0.00	-0.003	-0.01	-0.01	-0.01	-0.01
	(0.737)	(0.983)	(0.970)	(0.715)	(0.376)	(0.504)	(0.428)	(0.461)
EY	-0.03***	-0.03**	-0.03**	-0.03**	-0.03*	-0.03*	-0.02	-0.03*
	(0.009)	(0.010)	(0.013)	(0.01)	(0.058)	(0.079)	(0.11)	(0.055)
Spatial Effect								
Rho (W*Y)	0.48***	0.49***	0.49***	0.48***	0.21**	0.15	0.16	0.19**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.032)	(0.127)	(0.105)	(0.04)
N	280	280	280	280	280	280	280	280
R-sq	0.238	0.262	0.237	0.237	0.172	0.123	0.105	0.200
Log-Likelihood	305.5	307.6	309.3	305.6	226.2	239.3	240.9	228.2

Note: (i) Based on Authors' Calculations; Number in parentheses indicates p-value; (ii) Significance levels: *** - p<0.01; ** - p<0.05; and * - p<0.1.
(iii) RPC TTr – Real per-capita total transfers(net of loan); RPC FTr – Real per-capita formula transfers; RPC DTr – Real per-capita discretionary transfers; RPC GSDP – Real per-capita GSDP; PG – Population growth; and LOI – Law and Order Index; EY – Election Year; and ENP – Effective number of Political Parties.

Table 6: Spatial Convergence: Education and Health Expenditure 1991-92 to 2010-11

Dependent Variable: Growth in expenditure category	Real Per-Capita Education Expenditure				Real Per-Capita Health Expenditure			
	Excluding Transfers	Including Total Transfers (net of loan)	Including Formula Transfers	Including Discretionary Transfers	Excluding Transfers	Including Total Transfers (net of loan)	Including Formula Transfers	Including Discretionary Transfers
	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Initial Education Exp.	-0.25***	-0.26***	-0.26***	-0.25***				
	(0.000)	(0.000)	(0.000)	(0.000)				
Initial Health Exp.					-0.24***	-0.28***	-0.27***	-0.26***
					(0.000)	(0.000)	(0.000)	(0.000)
RPC GSDP	0.20***	0.19***	0.17***	0.20***	0.15***	0.07*	0.06	0.14***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.074)	(0.126)	(0.000)
RPC TTr		0.02				0.09***		
		(0.398)				(0.006)		
RPC FTr			0.03				0.093***	
			(0.179)				(0.005)	
RPC DTr				0.00				0.03
				(0.925)				(0.149)
PG	-1.46***	-1.44***	-1.42***	-1.46***	-1.52***	-1.43***	-1.40***	-1.54***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LOI	0.007	0.006	0.005	0.007	0.019	0.016	0.015	0.019
	(0.553)	(0.597)	(0.646)	(0.553)	(0.199)	(0.270)	(0.303)	(0.192)
ENP	-0.01	-0.01	-0.01	-0.01	-0.005	-0.004	-0.004	-0.004
	(0.173)	(0.199)	(0.199)	(0.180)	(0.674)	(0.719)	(0.698)	(0.702)
EY	0.001	0.001	0.002	0.001	-0.008	-0.007	-0.006	-0.008
	(0.929)	(0.924)	(0.884)	(0.932)	(0.584)	(0.606)	(0.673)	(0.562)
Spatial Effect								
Rho (W*Y)	0.53***	0.53***	0.53***	0.53***	0.49***	0.47***	0.47***	0.48***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.027)	(0.028)	(0.014)
N	280	280	280	280	280	280	280	280
R-sq	0.215	0.227	0.230	0.216	0.232	0.181	0.173	0.233
Log-Likelihood	323.1	323.4	324.0	323.1	254.8	258.5	258.7	255.8

Note: (i) Based on Authors' Calculations; Number in parentheses indicates p-value; (ii) Significance levels: *** - p<0.01; ** - p<0.05; and * - p<0.1.
(iii) RPC TTr – Real per-capita total transfers(net of loan); RPC FTr – Real per-capita formula transfers; RPC DTr – Real per-capita discretionary transfers; RPC GSDP – Real per-capita GSDP; PG – Population growth; and LOI – Law and Order Index; EY – Election Year; and ENP – Effective number of Political Parties.

Therefore based on this analysis, third hypothesis of equal impact of formula and discretionary transfers can be rejected. Formula transfers, distributed according to well-defined criteria have positive association with expenditure growth and result in faster expenditure convergence at sub-national level in India.

While analysing the impact of various control variables, it can be seen that per-capita GSDP has positive and significant association with growth of per-capita real expenditure in all categories. Therefore overall level of development of state governments also leads to higher expenditure growth. Further population growth is found to have negative association with expenditure growth in all categories. This result also holds in all specifications. Law and order index is found to be significant only for real per-capita total expenditure (Table 5). Therefore higher governance index is associated with higher growth of total per-capita expenditure. While observing political variables, it can be observed that election dummy is found to exert negative and significant impact on aggregate and development expenditure categories (Table 5). This indicates that per-capita expenditure growth has experienced a decline during the election years.

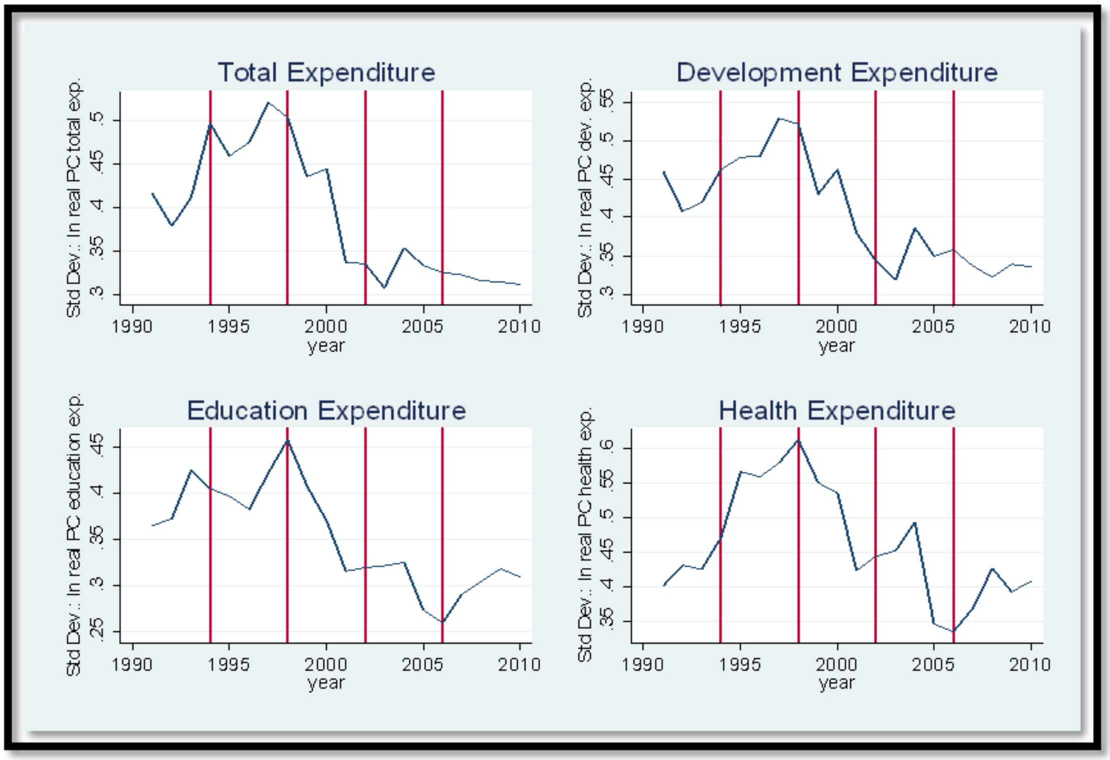
Going further to study the spatial spill-overs across states, a positive and significant *Rho* parameter indicates presence of spatial dependence of a state with all other states while determining its own expenditure growth. In other words, expenditure growth in one state is influenced by that of rest of the states where the nearer states have the larger impact than the farther states. This effect is observed in all expenditure categories. Of all categories studied in this paper, education expenditure seems to have higher spatial dependence. A states' education expenditure growth will increase by 0.53 percentage with average increase of one percentage point in all other states' education expenditure growth.

Sigma (σ) convergence

As mentioned earlier, β-convergence is not a sufficient condition for convergence. We proceed with sigma-convergence to observe whether disparities in level of per-capita expenditure are declining or increasing. The plot of standard deviation of log of real per-capita expenditure and its categories is depicted in Figure 1. It clearly indicates that standard deviation has a declining trend for a longer period with short time fluctuations.

Therefore states have become more alike in their per-capita expenditure over the period of 20 years. If analysed separately, it seems that second sub-period has been the period with rising inequality in all categories of expenditure, as marked by rising standard deviation.

Figure 1: Plot of Standard Deviation in Total Expenditure and its Various Categories (1991-92 to 2010-11): A Measure of Sigma (σ) Convergence



Note: (i) Based on Authors' Calculations. (ii) Vertical lines denote the 5 sub-periods considered in this study. Those five sub-periods are 1991-94, 1995-98, 1999-02, 2003-06 and 2007-10.

On the contrary third sub period indicates decline in inequality across states. While in the last sub-period ranging from 2006-10, a decline in inequality is observed for total and development expenditure, it has increased for rest two categories i.e. education and health expenditure.

7. Robustness Check

We check robustness of results in several ways. The results are computed using OLS, spatial autoregressive model and spatial error model. All three models have been computed by using alternative spatial matrix: inverse distance matrix and neighbourhood status matrix. Results are reported in Table A4 – A7 in appendix. Only the β-coefficient and spatial parameters (ρ (rho), λ (lambda)) are reported.[4] This part of analysis reveals change in results while comparing simple OLS model results with spatial models. First of all, log-likelihood of model estimation increases significantly in spatial models as compared to OLS estimation, whereas log-likelihood of both of the spatial models is comparable. Comparing magnitude of spatial parameters it seems that the lambda (λ) seems to be higher than rho (ρ) in every model specification. Presence of spatial pattern in error is partly due to omitted spatially weighted dependent variable. Therefore presence of spatial interaction with either of the models suggests that growth of public expenditure across states is not independent of each other. It is partly explained by spatial dependence in errors and partly by spatial dependence in their expenditure growth itself.

Further going to explore β-coefficient across all specification, it appears to be negative and significant. Therefore conditional convergence holds in aggregate public expenditure and its three categories. Further β-coefficient appeared to higher in magnitude where aggregate transfers (net of loan) are controlled as one of the independent variables. Same result also holds when we employ spatial matrix of neighbourhood status. Therefore finding of this study that federal transfers assist in faster convergence is robust.

Similarly effect of formula and discretionary transfers also seems to be consistent in all the models. Formula transfers lead to faster convergence as compared to discretionary transfers. This result can be confirmed in all the model specifications using both types of spatial matrices. Additionally effect of discretionary transfers, wherever significant, was to be lesser than that of formula transfers.

8. Conclusion and Discussion

With presence of large disparities in magnitude of public expenditure and high dependence of states on federal transfers, this study is an attempt to find the evidence for unconditional and conditional convergence in total per-capita real expenditure and its three categories with implications of total federal transfers (net of loan). Various transfer categories have different modes and methods of distribution; therefore, we divide aggregate transfers in two components: formula transfers and discretionary transfers.

[4] Full tables can be made available upon request.

In brief, this exercise highlights that expenditure growth, which is a measure of government expansion, is significantly associated not only with current state specific factors but also with past level of expenditure. While unconditional convergence is observed only in health expenditure, conditional convergence is found in all expenditure categories. With this analysis we can say that growth of per-capita expenditure is not independent of their initial level of per-capita of expenditure. It suggests that states with already high levels of per-capita expenditure are experiencing lesser growth in per-capita expenditure. These results are further supported by results from sigma-convergence, which highlights decrease in standard deviation in per-capita expenditure (for all categories) over a longer period of time with short-run fluctuations.

A key findings emerging from this analysis is that the federal transfers, meant to strengthen the expenditure capacity of sub-national governments, are helping to augment expenditure growth and as well as equalize level of per-capita expenditures across sub-national governments. It is important to note that, not all types of federal transfers have same impact on expenditure growth. Formula transfers seem to be expenditure augmenting more than discretionary components of the federal transfers. The former category also ensures faster convergence as compared to the latter.

Further it is observed that per-capita GSDP has positive and significant association with expenditure growth in all categories. On the other hand population growth is found to have negative association expenditure growth in all categories. Additionally, state governments experience lesser growth of expenditure during election years in all categories except education expenditure which does not show significant association with election year dummy.

Following literature on strategic interaction among different local governments, spatial effect was also incorporated explicitly in the analysis to identify spill-overs in expenditure growth. Results showed positive and significant spill-overs in all expenditure categories. It suggested that expenditure growth in a state is also influenced by expenditure growth in other states.

Results of this study are confirmed with several model specifications and therefore are robust.

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Appendix

A1. Overview of Federal Structure in India

India with 29 states and 6 union territories possesses a quasi-federal structure which specifies three characteristics for different tiers of governments: division of expenditure responsibilities, assignment of autonomous revenue sources and system of inter-governmental fiscal transfers (Bagchi, 2003). The last provision includes sharing the proceeds of centrally levied taxes and providing grants from Consolidated Fund of India. These transfers help states to bridge the gap between expenditure and their own revenue. The idea behind these constitutional provisions is manifold. First objective is to achieve uniformity in the tax rates all over the country along with avoiding tax evasion and the high cost of decentralized collection. Second is to ensure level playing field to states in terms of their public good provisions.

A1.1 Finance Commission (FC) Transfers

FC makes recommendation for sharing proceeds of central income tax and excise duties. It also provides grants-in-aid to states. Transfers made through FC serve two purposes. First it addresses the issue of vertical imbalance[5] and helps sub-national governments with inadequate revenues to meet their expenditure liabilities and perform functional responsibilities. This share was recommended at 30.5% by Twelfth Finance Commission (TWFC) (FC, 2004). Second, it addresses the issue of horizontal imbalance[6] by an attempt to remove disparities in revenue capacity of state and local bodies. This is based on some criteria which have been subjected to change over various FCs (Appendix, A1). A unified criterion consisting of factors like total population, total area, poverty ratio, difference form richest state, and tax effort etc. has been adopted since eighth FC (FC, 2000). Further, aspect of fiscal discipline was incorporated in devolution criteria during eleventh and twelfth FCs and fiscal capacity distance during thirteenth FC.

Equity Vs Efficiency

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[5] Vertical distribution refers to the revenue sharing between different layers of government i.e. a part of revenue collected by central government from certain taxes is shared with states.

[6] Horizontal distribution refers to distribution of transfers across states i.e. determining each states' share in the total recommended share of central taxes.

FC pursue two basic principles while determining the share of each state in divisible pool of union taxes[7], those are equity and efficiency. Principle of equity is followed to even out the resource deficiencies across states so that each state is able to ensure a comparable level of public services to its residents. However objective of equity does not, by itself, guarantee the uniformity in delivery of public services. It can generate adverse incentive for states to show resource deficiency in its funds. Therefore FC addresses this question of adverse incentive by its second objective of efficiency by motivating states to exploit their resource base and providing comparable level of public services in a cost effective manner and also by imposing some conditions in devolution of grants (FC, 2000, 2004, 2009).

FC also recommends the distribution of grants-in-aid to the states. These grants are provided to states to cover their deficit on non-plan revenue account, which is assessed post devolution of taxes and excise duties. Grants-in-aid can also be recommended for up-gradation of administrative set up of states and to finance any special problem peculiar to that state. These play an important role to address specific needs of a state, because devolution criteria of union taxes, by way of its construction, cannot take into account all the dimensions of fiscal needs of a state (FC, 2004). Some examples of these grants would be: grants given for education and health sector, grants for forests, heritage conservation during TWFC, grants for environment improvement, water sector management and for better justice delivery during Thirteenth Finance Commission (THFC).

A1.2. Planning Commission (PC) Transfers

With implementation of first five year plan in India, development planning gained emphasis. Planning commission, which charted out the five year plans for central and state governments, was the major dispenser of funds to the states. One objective of these transfers was to achieve balanced regional growth. However the central assistance provided prior to fourth plan was *ad hoc* in nature and was not directed to states with reasonable degree of objectivity. Such transfers did not promote the objective of balanced growth.

[7]For details, please refer to Finance Commission (2003); and Chakraborty and Isaac (2008).

Table A1: Criteria of FC Transfers

FC	Criteria										Applicable to
	Population	**Distance**	**Inverse of Income**	**Poverty Ratio**	**Index of Backwardness**	**Area**	**Index of Infrastructure**	**Tax Effort**	**Fiscal Discipline**	**Fiscal Capacity Distance**	
Eighth	25	50	25	-	-	-	-	-	-	-	90% of Shareable IT
Ninth (I report)	25	50	12.5	12.5	-	-	-	-	-	-	40% of UED
Ninth (II report)	25	50	12.5	-	12.5	-	-	-	-	-	90% of Shareable IT
	29.94	40.12	14.97	-	14.97	-	-	-	-	-	37.575% of UED
Tenth	20	60	-	-	-	5	5	10	-	-	100% of Shareable IT and 40% of UED
Eleventh	25	50	-	-	-	10	-	7.5	7.5	-	-
Twelfth	10	62.5	-	-	-	7.5	7.5	5	7.5	-	-
Thirteenth	25	-	-	-	-	10	-	-	17.5	47.5	-

Source: FC (2000, 2004, 2009)

With criticisms raised by states, during formulation of fourth five year plan, a well-designed formula was adopted for inter-governmental transfers in a rational manner without any degree of discretion. This was known as Gadgil formula, after the name of the then deputy chairman of PC (Ramalingom and Kurup, 1991). This formula was constructed with inclusion of factors such as: population, per-capita income of a state, tax effort defined as ratio of per-capita tax receipts to per-capita income, special problems of specific states etc.

Table A2: Criteria for PC Transfers: Gadgil Formula

	Criteria	**Modified Gadgil Formula (1980)**	**NDC Revised Formula (1990)**	**NDC Revised Formula (1991)**
A.	**Special Category States (10)**	30% share of 10 States excluding North Eastern Council	30% share of 10 States including North Eastern Council	30% share of 10 States excluding North Eastern Council
B.	**General Category States (15)**			
(i)	Population (1971)	60	55	60
(ii)	Per Capita Income	20	25	25
	Of which			
a.	According to the `deviation' method covering only the states with per capita income below the national average	20	20	20
b.	According to the `distance' method covering all the fifteen states	-	5	5
(iii)	Performance	10	5	7.5
	Of which			
a.	Tax effort	10	-	2.5
b.	Fiscal management	-	5	2.5
c.	National objectives	-	-	2.5
(iv)	Special problems	10	15	7.5
	Total	**100**	**100**	**100**

Notes: 1. Fiscal management is assessed as the difference between states' own total plan resources estimated at the time of finalizing Annual Plans and their actual performance, considering latest five years.

2. Under the criterion of the performance in respect of certain programmes of national priorities the approved formula covers four objectives, *viz*.: (i) population control; (ii) elimination of illiteracy; (iii) on-time completion of externally aided projects; and (iv) success in land reforms.

Source: PC (2012).

Population was assigned the highest weight of 60%. The aggregate plan assistance to states was a composition of ratio of loans and grants and this ratio was different for special category states and general category states[8]. Gadgil formula has been changed over time by changing the

[8] While loans constituted 70% and grants 30% for general category states, grants were 90% and loans were 10% for special category states.

relative weights assigned to different components as well as with inclusion of new factors (Appendix, A2). Factors like fiscal discipline, distance form highest income states were also incorporated into the formula.

A1.3 Transfers through central Ministries

Various central ministries transfer resources to states for implementation of various Centrally Sponsored Schemes (CSS) and Central Plan Schemes (CPS) etc. While CPSs are wholly funded by the centre, expenditure responsibility in CSS is shared between centre and state governments. Some examples of CSS are Sarva Shiksha Abhiyan (SSA), Mahatama Gandhi National Rural Employment Guarantee Act (MGNREGA) etc. In addition, states also have the responsibility of maintaining the assets created under CSSs. ■

Table A3: Moran's I Statistics

Expenditure Category (In Log Real Per-capita Terms)	1991	1995	2000	2005	2010
Total Exp.	0.1*** (0.003)	0.09*** (0.004)	0.04** (0.02)	0.07** (0.011)	0.09*** (0.003)
Development Exp.	0.09*** (0.004)	0.09*** (0.003)	0.04** (0.02)	0.13*** (0.001)	0.08** (0.013)
Education Exp.	0.09*** (0.007)	0.07** (0.013)	0.06** (0.015)	0.07** (0.016)	0.03* (0.063)
Health Exp.	0.11*** (0.002)	0.08*** (0.008)	0.06** (0.015)	0.13*** (0.002)	0.09*** (0.005)

Note: Based on Authors Calculations. Spatial matrix is constructed as the inverse of the Euclidian distance between centroid of states.
Data Source: RBI (2004, 2010, 2012)

Figure A1: State-wise Real Per-Capita Aggregate Expenditure: 2010-11

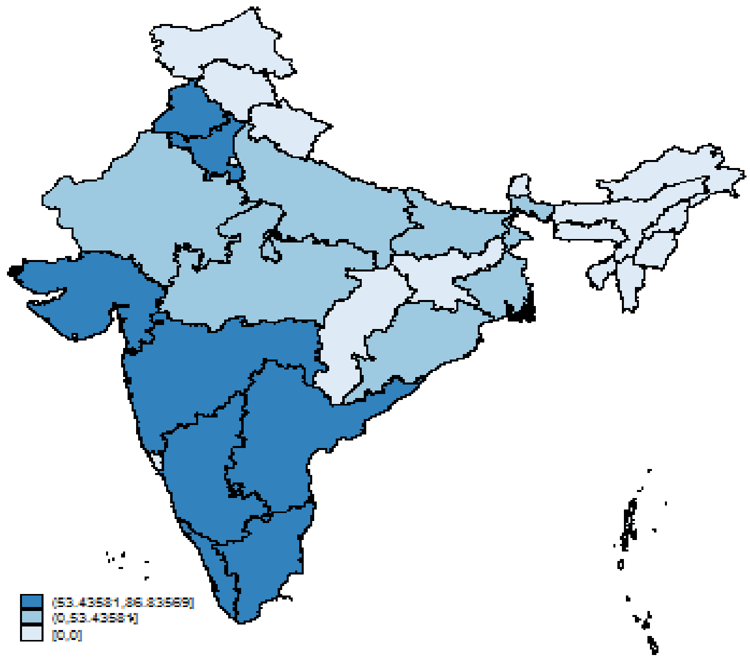

Figure A2: State-wise Real Per-Capita Development Expenditure: 2010-11

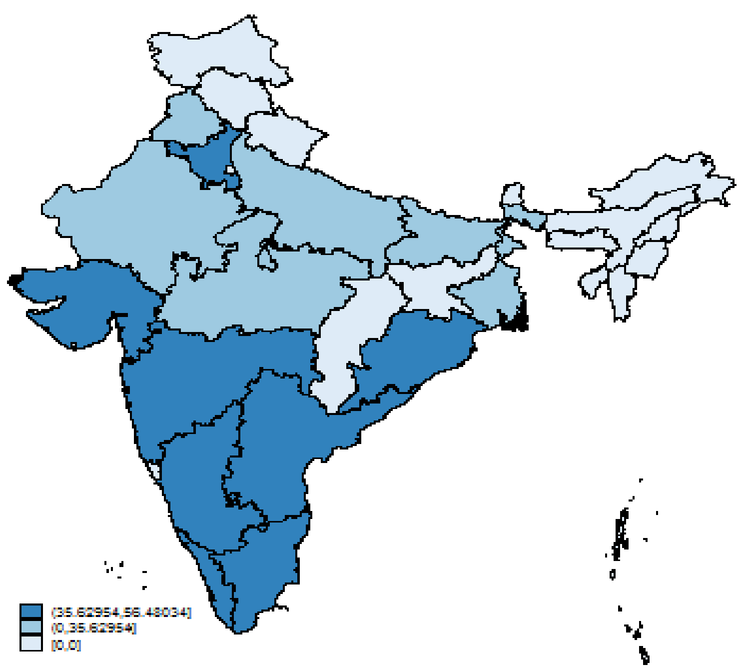

Figure A3: State-wise Real per-capita Education Expenditure

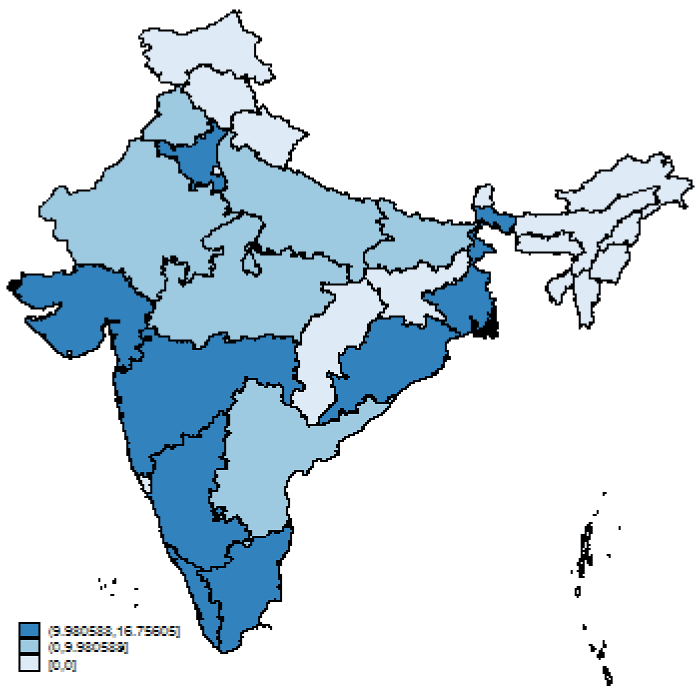

Figure A4: State-wise Real per-capita Health Expenditure

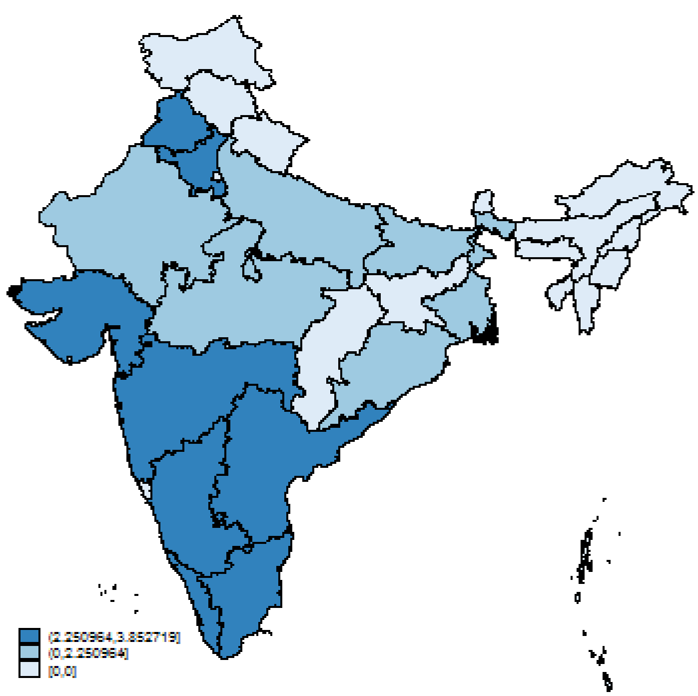

Table A4: OLS Fixed Effect and Spatial Model Estimation with Inverse Distance Matrix: Aggregate Expenditure and Development Expenditure

		Dependent Variable: Growth in Aggregate Per-capita Real Expenditure				**Dependent Variable:** Growth in Per-capita Real Development Expenditure			
Model		Excluding Transfers	Including Total Transfers (net of loan)	Including Formula Transfers	Including Discretionary Transfers	Excluding Transfers	Including Total Transfers (net of loan)	Including Formula Transfers	Including Discretionary Transfers
OLS (Panel Fixed Effect)	*beta-coefficient*	-0.29***(0.00)	-0.32***(0.00)	-0.33***(0.00)	-0.28***(0.00)	-0.34***(0.00)	-0.47***(0.00)	-0.45***(0.00)	-0.38***(0.00)
	N ,T	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20
	R-sq	0.298	0.302	0.312	0.300	0.277	0.346	0.354	0.289
	Log-likelihood	286.9	287.8	289.7	287.3	224.0	238.1	239.7	226.4
Spatial Auto-Regressive Model	*beta-coefficient*	-0.26***(0.00)	-0.29***(0.00)	-0.30***(0.00)	-0.25***(0.00)	-0.33***(0.00)	-0.46*** (0.00)	-0.44***(0.00)	-0.37***(0.00)
	Rho	0.48***(0.00)	0.49***(0.00)	0.46***(0.00)	0.48***(0.00)	0.21**(0.03)	0.15 (0.127)	0.16 (0.105)	0.19**(0.049)
	N, T	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20
	R-sq	0.238	0.262	0.237	0.237	0.172	0.123	0.105	0.200
	Log-likelihood	305.5	307.6	309.3	305.6	226.2	239.3	240.9	228.2
Spatial Error Model	*beta-coefficient*	-0.28***(0.00)	-0.38***(0.00)	-0.36***(0.00)	-0.30***(0.00)	-0.34***(0.00)	-0.47***(0.00)	-0.45***(0.00)	-0.37***(0.00)
	lambda	0.53***(0.00)	0.59***(0.00)	0.57***(0.00)	0.54***(0.00)	0.27** (0.010)	0.19 (0.101)	0.19 (0.102)	0.23**(0.038)
	N, T	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20
	R-sq	0.222	0.170	0.170	0.230	0.157	0.123	0.108	0.181
	Log-likelihood	306.6	312.9	313.7	306.8	227.1	239.4	240.9	228.3

Note: (i) Based on Authors' Calculations; Number in parentheses indicates p-value;
(ii) Significance levels: *** - p<0.01; ** - p<0.05; and * - p<0.1.
(iii) This table gives only β-coefficient and spatial parameters. Full tables can be made available upon request.
(iv) *Rho* specifies the auto-regressive parameter estimating spill-overs with weighted dependent variable.
(v) *Lambda* specifies the coefficient of weighted error term. The weight matrix constitutes of the inverse distance between centroid of states.

Table A5: OLS Fixed Effect and Spatial Model Estimation with Inverse Distance Matrix: Education and Health Expenditure

	Dependent Variable: Growth in Aggregate Per-capita Education Expenditure					**Dependent Variable:** Growth in Per-capita Real Health Expenditure			
Model		Excluding Transfers	Including Total Transfers (net of loan)	Including Formula Transfers	Including Discretionary Transfers	Excluding Transfers	Including Total Transfers (net of loan)	Including Formula Transfers	Including Discretionary Transfers
OLS	*beta-coefficient*	-0.29***(0.00)	-0.30***(0.00)	-0.30***(0.00)	-0.29***(0.00)	-0.28***(0.00)	-0.33***(0.00)	-0.32***(0.00)	-0.32***(0.00)
	N, T	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20
	R-sq	0.328	0.330	0.332	0.328	0.303	0.328	0.328	0.311
	Log-likelihood	298.6	298.9	299.4	298.6	233.8	238.8	238.9	235.3
Spatial Auto-Regressive Model	*beta-coefficient*	-0.25***(0.00)	-0.26***(0.00)	-0.26***(0.00)	-0.25***(0.00)	-0.24***(0.00)	-0.28***(0.00)	-0.27***(0.00)	-0.26***(0.00)
	Rho	0.53***(0.00)	0.53***(0.00)	0.53***(0.00)	0.53***(0.00)	0.49***(0.00)	0.47***(0.00)	0.47***(0.00)	0.48***(0.00)
	N, T	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20
	R-sq	0.215	0.226	0.229	0.215	0.232	0.181	0.173	0.233
	Log-likelihood	323.1	323.4	324.0	323.1	254.8	258.5	258.7	255.8
Spatial Error Model	*beta-coefficient*	-0.29***(0.00)	-0.33***(0.00)	-0.33***(0.00)	-0.29***(0.00)	-0.29***(0.00)	-0.33***(0.00)	-0.32***(0.00)	-0.31***(0.00)
	Lambda	0.58***(0.00)	0.59***(0.00)	0.59***(0.00)	0.58***(0.00)	0.56***(0.00)	0.56***(0.00)	0.56***(0.00)	0.56***(0.00)
	N, T	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20	14, 20
	R-sq	0.165	0.205	0.209	0.168	0.222	0.240	0.240	0.232
	Log-likelihood	325.3	327.2	328.3	325.4	260.6	263.7	263.8	261.0

Note: (i) Based on Authors' Calculations; Number in parentheses indicates p-value;
(ii) Significance levels: *** - p<0.01; ** - p<0.05; and * - p<0.1.
(iii) This table gives only β-coefficient and spatial parameters. Full tables can be made available upon request.
(iv) *Rho* specifies the auto-regressive parameter estimating spill-overs with weighted dependent variable.
(v) *Lambda* specifies the coefficient of weighted error term. The weight matrix constitutes of the inverse distance between centroid of states.

Table A6: OLS Fixed Effect and Spatial Model Estimation with Neighbouring Matrix: Aggregate Expenditure and Development Expenditure

Model		**Dependent Variable:** Growth in Aggregate Per-capita Real Expenditure				**Dependent Variable:** Growth in Per-capita Real Development Expenditure			
		Excluding Transfers	Including Total Transfers (net of loan)	Including Formula Transfers	Including Discretionary Transfers	Excluding Transfers	Including Total Transfers (net of loan)	Including Formula Transfers	Including Discretionary Transfers
Spatial Auto-Regressive Model	*beta-coefficient*	-0.263***	-0.295***	-0.304***	-0.256***	-0.325***	-0.458***	-0.439***	-0.365***
		[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
	Rho	0.336***	0.341***	0.339***	0.334***	0.180***	0.150**	0.154**	0.171***
		[0.000]	[0.000]	[0.000]	[0.000]	[0.004]	[0.015]	[0.012]	[0.006]
	N	280	280	280	280	280	280	280	280
	R-sq	0.236	0.288	0.253	0.229	0.174	0.118	0.100	0.201
	ll	303.5	305.1	306.9	303.7	228.0	241.0	242.7	230.0
Spatial Error Model	*beta-coefficient*	-0.287***	-0.348***	-0.343***	-0.285***	-0.347***	-0.472***	-0.451***	-0.376***
		[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
	Lambda	0.378***	0.411***	0.401***	0.377***	0.224***	0.180**	0.183**	0.204***
		[0.000]	[0.000]	[0.000]	[0.000]	[0.001]	[0.011]	[0.010]	[0.004]
	N	280	280	280	280	280	280	280	280
	R-sq	0.230	0.235	0.207	0.228	0.159	0.124	0.108	0.184
	ll	304.1	307.7	309.2	304.1	228.9	241.2	242.8	230.2

Note: (i) Based on Authors' Calculations; Number in parentheses indicates p-value;
(ii) Significance levels: *** - $p<0.01$; ** - $p<0.05$; and * - $p<0.1$.
(iii) This table gives only β-coefficient and spatial parameters. Full tables can be made available upon request.
(iv) *Rho* specifies the auto-regressive parameter estimating spill-overs with weighted dependent variable.
(v) *Lambda* specifies the coefficient of weighted error term.
(vi) The weight matrix is defined on the basis of neighbourhood status.

Table A7: OLS Fixed Effect and Spatial Model Estimation with Neighbouring Matrix: Education and Health Expenditure

Model		**Dependent Variable:** Growth in Per-capita Real Education Expenditure				**Dependent Variable:** Growth in Per-capita Real Health Expenditure			
		Excluding Transfers	Including Total Transfers (net of loan)	Including Formula Transfers	Including Discretionary Transfers	Excluding Transfers	Including Total Transfers (net of loan)	Including Formula Transfers	Including Discretionary Transfers
Spatial Auto-Regressive Model	*beta-coefficient*	-0.256***	-0.262***	-0.265***	-0.257***	-0.253***	-0.295***	-0.284***	-0.281***
		[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
	Rho	0.384***	0.384***	0.383***	0.384***	0.307***	0.292***	0.291***	0.302***
		[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
	N	280	280	280	280	280	280	280	280
	R-sq	0.214	0.236	0.252	0.214	0.232	0.181	0.174	0.235
	ll	321.3	321.5	322.0	321.3	247.1	251.0	251.0	248.3
Spatial Error Model	*beta-coefficient*	-0.296***	-0.314***	-0.317***	-0.298***	-0.311***	-0.343***	-0.332***	-0.329***
		[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
	Lambda	0.434***	0.439***	0.440***	0.435***	0.403***	0.389***	0.385***	0.398***
		[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
	N	280	280	280	280	280	280	280	280
	R-sq	0.175	0.217	0.229	0.177	0.234	0.224	0.228	0.242
	ll	322.5	323.4	324.2	322.6	254.0	257.1	256.7	254.6

Note: (i) Based on Authors' Calculations; Number in parentheses indicates p-value;
(ii) Significance levels: *** - p<0.01; ** - p<0.05; and * - p<0.1.
(iii) This table gives only β-coefficient and spatial parameters. Full tables can be made available upon request.
(iv) *Rho* specifies the auto-regressive parameter estimating spill-overs with weighted dependent variable.
(v) *Lambda* specifies the coefficient of weighted error term.
(vi) The weight matrix is defined on the basis of neighbourhood status.