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Re-Examining the Issues in Indian Fiscal Federalism

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Institute of Development Studies, Jaipur (INDIA)

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This paper tests and analyses the extent of progressivity of the equity principle and suggests an alternative approach, which would reduce the observed fiscal imbalance. The dynamics of the principle needs re-examination as it is the only ray of hope in the process of devolution in bringing progressivity. Income Distance, Inverse Income and Fiscal Capacity Distance Methods have been used as equity principle at different time periods to distribute transfers in the form of shared taxes and grants among states for maintaining horizontal balance. Although the introduction of equity principle has brought progressivity upto some extent in distribution of these transfers, fiscal imbalances still persist and increase over time due to (1) the implicit weight of population, and : (2) Error in estimation of deficiency-in-fiscal-capacity.

Introduction

The equity based component of Centre-State financial transfer has been in debate because of persistence fiscal imbalances between different and within the same level of governments in India.[1] These imbalances result in macroeconomic instability, micro-economic inefficiency and distributional inequity. The observed increasing fiscal imbalances may be attributed to (1) loopholes in the methods of devolution and (2) increasing political interference in the decision making bodies of 'institutions of transfer'. Since devolution through formulae ensures certainty and automaticity of transfer with minimal exogenous interferences, formulae based methods are better choice compared to non-formulae-based (discretionary) method. Equity principle covers a significant share of formulae-based transfer. However, the transfers through this process fail to sticks to its objective. In other words, inequality across state has increased[2].

This raises question on the efficacy of the 'equity principle' in addressing the issue[3]. With this background, this paper attempts to examine the 'progressivity of equity principle' and suggest an alternative approach which would be helpful to minimize fiscal imbalance by ensuring transfer on the basis of 'deficiency in fiscal capacity'.

The context and review of issue of equity principle is discussed in Part I. The characteristics of Income Distance Method (IDM), Fiscal Capacity Distance Method (FCDM), and Inverse Income Method (IIM) examined in Part II. Part III explains about the Alternative Approach (AA) and

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examines it's advantage over the existing methods. A comparative empirical analysis of IDM and AA is given in Part IV followed by conclusion in Part V.

Section 1

1.1 The Context

The equity-based transfer is under criticism for regressive characteristic of method it follows. The attention is more on the equity based transfer not only due to methodological disagreement associated with it rather it is the only method through which progressivity can be ensured. Transfers through equity principle constitute 42.4% of Formula-Based Transfer(FBT)[4], which accounts for 47% of the formulae based transfers of the Finance Commission (FC) and 25% of FBT of the Planning Commission (PC) during the 12th FC period[5]. Out of total devolution, transfer through this principle constitutes 35.2%. Rest 64.8% transfer routed through (1) different formulae (47.8%) like neutral criteria, fiscal discipline criteria[6], special problem & national objectives, and (2) discretionary method (17%). Even though, other than equity based transfer constitutes a significant proportion of total transfer, the criteria adopted for these transfers are not sensitive enough towards deficiency in fiscal capacity of states.

Transfers through 'Equity Principle' ensure progressivity on the basis of deficiency-in-fiscal capacity.[7] Theoretically, states with low fiscal capacity should get more shares compared to states with high fiscal capacity, and states having the same fiscal capacity should get same proportionate share (Rangarajan and Srivastava, 2008, p. 58, Axiom 3). In other words, there exists an inverse and/or progressive relationship between fiscal capacity and transfer, which in turn, increase the likelihood of making states self-sufficient in terms of fiscal capacity. Self-sufficiency in fiscal capacity may ensure provision of common minimum level of public goods per unit of tax price across states. This is necessary to maintain fiscal balances - horizontal and vertical[8] in fiscal federalism.

Equity principle has been introduced for devolution since 6th FC period (1974) to resolve the horizontal imbalance. Various methods, viz., IDM, FCDM and IIM have been used as equity principle with increasing weights[9] over different time period by the FC and the PC (See Appendix I; Table 1, 2, 3 and 4). For devolution of union excise duties, FC has used IDM (during 6th FC period) and IIM (during 7th FC period) with a weightage of 25% in each method. However both IDM and IIM were used simultaneously during eighth and ninth FC period to distribute tax transfers among states[10]. Later on, the FC concentrated only on IDM for devolution during 10th to 12th FC period[11]**.** Subsequently, IDM has been modified to FCDM by the FC and was used as the only equity criterion during 13th FC period. However, the PC which deals with plan transfers has been using the IIM for grants and loans transfer since fifth FC (1969).[12]

The devolution process follows broadly two norms: (1) deficiency-in-fiscal capacity-based-norm[13]: (2) other than deficiency-in-fiscal-capacity-based-norm.[14]. Efforts to bring equality through transfer following 'deficiency-in-fiscal-capacity' as the criterion have many advantages over

criteria used by the later norms. Moreover, the former norm is ethically neutral and less influenced by political factor as compared to the later norm.

1.2 Review of Literature:

In Fiscal Federalism literature, broadly two sets of views have emerged on methodology of equity principle. While one set argues in favour of the progressive characteristic of the principle, the other set is vehemently critical about it.

The former group tries to establish the progressive characteristics of the principle using the plea of the inverse relationship between per capita share and per capita income (Srivastava and Aggarwal, 1994, p. 453). However mere fulfillment of this nature of relationship between variables is not sufficient to establish the progressivity of the principle. In addition to the nature of relationship, progressivity requires to satisfy an increasing rate of responsiveness of one variable with other associated variable (Musgrave, Richard. A., 1961). Therefore, the nature of argument put forth here to establish progressivity of the principle is conceptually fallacious. Kumar, T. Ravi, 2001, p. 4673; argues for the progressivity of the 'transfer' rather than the progressivity of the 'principle'. His argument is based on the devolution of income tax and union excise duties, which generally transfer through all formulae (as discussed earlier). His observation is based on transfer of above mentioned taxes across FC period (8^{th} to 12^{th} FC), rather than across states within a particular FC period. Argument is, the transfer is progressive because the rate of devolution to poorer states has increased marginally during 8^{th} FC to 11^{th} FC as compared to the rich states and further decline due to fall in the weight of the equity principle (IDM method) during 12^{th} FC period. Nevertheless, more amounts of transfers have gone in favour of high and middle income states in proportion to their fiscal capacity[15].

The later group opines that the principle has been regressive in nature due to the implicit weight of population. Population being implicit, the principle gives more priority to populous states by relegating need and justice. In other words, states having high per capita income with more population often get higher share than states with low per capita income as well as population. Even though the principle has been criticized, little attention has been drawn to scientifically analyze its structure. Except frequent changes in the weight, no other effort has been made to ensure the devolution through this principle on the basis of deficiency in fiscal capacity.

Section II

2.1 Re-Examining Equity Principle

Equity based transfer is attributed to both FC and PC. Even if the objective of both these institutions is same, methods used as equity principle are different. Even though there are disagreements regarding the progressive characteristic of the principle, it has been observed that regressivity is systematically in-built in its fundamentals as reflected from the persistence and rising horizontal imbalance in the country (Rao *et al*, 1996, pp.104-114; Rao, 2003, p.47; Mukhopadhyay *et al,* 2003, p. 1416; Rangarajan and Srivastava, 2003, p.1-53; Rao *et al*, 2003, p.15). However, progressivity[16] of the principle is the only way to maintain fiscal balance across states.

Elsewhere, it is also mentioned that the transfer process of PC is found to be less progressive as compared to that of FC. This variation may be due to their level of affiliation to the different systems[17]. However the constitutional stand of FC has been diluting over the years with the appointment of political persons, either as the chairmen or as a member, into the commission (Tripathi *et al*, 2003, pp. 168-169).

2.2 Income Distance Method

As per the 'IDM[18], the per capita share of revenue transfer (here after share) of states is progressive with respect to per capita income (Srivastava and Aggarwal, 1994, p.453). It has been interpreted in the sense of negative constant change in per capita share due to per unit change in per capita income across states. In other words, when the change in per capita share due to per unit change in per capita income across states is negative and constant (negative linear relationship), the criterion described in literature as progressive is ambiguous.

The rate of change in per capita share with respect to per capita income is derived by taking partial derivative of equation (iv) in Appendix II,

$$\frac{\partial a_i^*}{\partial Y_i} = \frac{\partial\left(\alpha\left(Y_s - Y_i\right)\right)}{\partial Y_i} = -\alpha \quad \text{..... (1)}$$

The negative symbol of the slope coefficient in equation (1) implies an inverse relationship between the numerator and denominator. The rate of change in per capita share is constant (See also Appendix VI). As a result of that the principle may not be treated as progressive as described. The constant rate of decline in the slope coefficient gives more per capita share to middle income states compared to low and high income states. The loss of low income states is due to the distribution of transfers in accordance with the proportionate change in per capita income and not in proportion to backwardness.

It further increases/decreases depending upon the rate at which the share changes (constant rate) which in turn depends on the concentration of proportion of population in different income category states. This constant rate becomes higher if there is higher concentration of population on the high income and middle income group states than low income states. If there is more concentration of population on the high and middle income group states, the higher rate of decline in the slope results in loss of low income states and vice versa. This hidden weight of population has been ignored in testing progressivity.

The progressivity can be measured by examining the effect of both income as well as population on transfer. Therefore, the rate of change in share of states is a function of both per capita income and population.

According to IDM the share of a state can be written as,

$A_i = \alpha(Y_s - Y_i)N_i$ as mentioned in equation (ii) of the Appendix II.

By using total derivative, change in share with respect to change in per capita income and population can be obtained,

$$dA_i = d\left[\alpha\left(Y_s - Y_i\right)N_i\right]$$

$$= d\left(\alpha Y_s N_i\right) - d\left(\alpha Y_i N_i\right)$$

$$= \alpha Y_s dN_i - \alpha Y_i dN_i - \alpha N_i dY_i$$

$$= \alpha\left[\left(Y_s - Y_i\right)dN_i - N_i dY_i\right] \quad \text{..... (2)}$$

The per capita change in share can be obtained by dividing the change in share of a state by its total population.

$$dA_i^{*} = \alpha\left[\left(Y_s - Y_i\right)\frac{dN_i}{N_i} - dY_i\right] \rangle 0 \quad \text{..... (3)}$$

Where, $\frac{dAi}{Ni} = dA_i^{*}$ (per capita change in share of i^{th} state)

Equation (3) indicates a positive relation between the explained and explanatory variables. However, the rate of response of the explained variable to per unit change in explanatory variables can only be captured through the second order derivative.

$$d\left(dA_i\right) = d\left(\alpha Y_s\right)dN_i - d\left(\alpha Y_i\right)dN_i - d\left(\alpha N_i\right)dY_i$$

$$= -\alpha dN_i dY_i - \alpha dN_i dY_i = -2\alpha dN_i dY_i \langle 0 \quad \text{..... (4)}$$

The rate of response of per capita change in share can be obtained by dividing the change in share of a state by its total population.

$$\frac{d^2 A_i}{N_i} = \frac{-2\alpha dN_i dY_i}{N_i} \langle 0$$

$$= -2\alpha dY_i \frac{dN_i}{N_i} \langle 0 \quad \text{..... (5)}$$

Four inferences may be drawn from equations (3) and (5):

(1) The per capita change in share increases at a diminishing rate with the rise in per capita income and/ or population.

(2) When, $Y_s = Y_i$ the i^{th} state will be assigned with 'zero' share. But, when the per capita income of a state becomes greater than the standard per capita income the state is assigned a negative share.

(3) In order to avoid 'zero or negative share' to state with highest per capita income, the FC has used the next highest per capita income (8th, 9th and 10th FC) and average of first three highest per capita incomes (11th and 12th FC) as a proxy variable for it. Apart from this it has assigned a fixed per capita share (13th FC) to state with highest per capita income. If first method is followed, the state with highest per capita income will get relatively more share than the state whose per capita income has been used as proxy variable. It is just because the per capita change in share transfer between the two states becomes zero. However, as compared to middle income state the high income states have obtained relatively less per capita share viewed from the proportion of backwardness[19]. If the average of first three states with highest per capita income is used as standard per capita income, states with higher per capita income than the average gets relatively more share than states whose per capita income has been used as proxy for states (three) with highest per capita income. State whose per capita income is next to the first three highest per capita incomes of states gets the lowest share than all states participate in sharing[20]. Apart from this, the share decreases with increase in the level of backwardness across states. When a fixed per capita share is assigned to states with first three highest per capita incomes, the amount may be higher or lower than the actual proportion, what they ought to get, depends on the prerogative of the FC.

(4) When both per capita income ($Y_i \neq Y_m$) as well as population ($N_i \neq N_m$) of two states are different, the rate of change in per capita share depends on the relative strength of the proportionate change in population as well as per capita income[21]. It has been estimated that the relative strength of per capita income is two times of the relative strength of population. This indicates that when the relative strength of population exceeds two times relative strength of per capita income, the change in per capita share increases even if the per capita income increases and vice versa.

The change in per capita share becomes proportional when population across states is same ($\frac{dN_i}{N_i} = 0$). But in real situation there is greater variation in the size of population across states in India[22]

2.3 Fiscal Capacity Distance Method

Under FCDM, the share of general and special category states have been dealt separately[23]. The change in share of general category states due to the change in population and income is derived by using total derivative of equation (i) of the Appendix III.

$$dS_i = d\left[\alpha N_i\left(ay^* - a_g y_i\right)\right]$$

$$= d\left(\alpha N_i a y^*\right) - d\left(\alpha N_i a_g y_i\right)$$

$$= \alpha a y^* dN_i - \alpha a_g y_i dN_i - \alpha a_g N_i dy_i$$

$$= \alpha\left(ay^* - a_g y_i\right) dN_i - \alpha a_g N_i dy_i$$

$$= \alpha\left[\left(ay^* - a_g y_i\right) dN_i - a_g N_i dy_i\right] \quad \text{..... (6)}$$

The per capita change in share of general category states can be obtained by dividing the change in share (equation 6) by their respective population,

$$\frac{dS_i}{N_i} = \alpha\left[\left(ay^* - a_g y_i\right)\frac{dN_i}{N_i} - a_g dy_i\right] > 0 \quad \text{..... (7)}$$

In order to know the behavior of the rate of change, second order derivative of equation (6) has to be obtained,

$$d\left(dS_i\right) = d\left(\alpha\left[\left(ay^* - a_g y_i\right) dN_i - a_g N_i dy_i\right]\right)$$

$$= d\left(\alpha a y^*\right) dN_i - d\left(\alpha a_g y_i\right) dN_i - d\left(\alpha a_g N_i\right) dy_i$$

$$= -\alpha a_g dN_i dy_i - \alpha a_g dN_i dy_i$$

$$= -2\alpha a_g dN_i dy_i \quad \text{..... (8)}$$

The nature of change in per capita share can be derived by dividing equation (8) by.

$$\frac{d^2 S_i}{N_i} = \frac{-2\alpha a_g dN_i dy_i}{N_i}$$

$$= -2\alpha a_g dy_i \frac{dN_i}{N_i} \langle 0 \quad \text{..... (9)}$$

The share of the special category state[24] is,

$$S_i = \alpha\left(N_i(ay^* - a_s y_i\right)$$

The change in the share of the special category state is given by the following.

$$dS_i = d\left[\alpha\left(N_i(ay^* - a_s y_i)\right)\right]$$

$$= d\left(\alpha a N_i y^*\right) - d\left(\alpha a_s N_i y_i\right)$$

$$= \alpha a y^* dN_i - \alpha a_s y_i dN_i - \alpha a_s N_i dy_i$$

$$= \alpha a y^* dN_i - \alpha a_s y_i dN_i - \alpha a_s N_i dy_i \quad \text{..... (10)}$$

Furthermore, the per capita change in the share of special category state has been derived in the same line as that of general category states from equation 10.

$$\frac{dS_i}{N_i} = \alpha\left[\left(ay^* - a_s y_i\right)\frac{dN_i}{N_i} - a_s dy_i\right] \quad \text{..... (11)}$$

The behavior of the change in slope is derived by using second order derivative of equation (10),

$$d\left(dS_i\right) = d\left(\alpha\left[\left(ay^* - a_s y_i\right)dN_i - a_s N_i dy_i\right]\right)$$

$$= d\left(\alpha a y^*\right)dN_i - d\left(\alpha a_s y_i\right)dN_i - d\left(\alpha a_s N_i\right)dy_i$$

$$= -\alpha a_s dN_i dy_i - \alpha a_s dN_i dy_i$$

$$= -2\alpha a_s dN_i dy_i \quad \text{..... (12)}$$

The behavior of per capita change in slope in share is given by

$$= -2\alpha a_s dy_i \frac{dN_i}{N_i} \langle 0 \quad \text{..... (13)}$$

What do these equations (7, 9 11 and 13) speak :

(1) Discrimination has been in-built in FCDM, resulting in favorable treatment to special category states as compared to general category states by allowing use of two different sets of average tax effort for both these group of states separately. In other words, the use of separate tax effort provides more shares to special category states as the average tax effort of these states is always lower than the general category states. Discrimination has also been observed within special as well as general category states. Two states with different tax effort belonging to the same group having same per capita income receives equal share. This happens because the same average tax- GDP ratio is used for all states of a particular group. In this case variables (1) average tax GDP ratio, and (2) per capita income are same for two states.

(2) State having higher actual tax-GDP ratio than the average gets more share than what it would have got if the actual tax-GDP ratio had been used, due to the use of average tax - GDP ratio.

(3) All the conclusions of the IDM correspond to this method.

2.4 Inverse Income Method

The IIM is progressive with respect to per capita income due to the negative sign of the change in share due to change in per capita income. The degree of progressivity changes with the level of per capita income (Srivastava and Aggarwal, 1994, p. 454). According to this method, the per capita share of a state can be expressed by equation (iv) in the Appendix IV as

$$bi^* = \frac{\beta}{Y_i}$$

$$\text{Where } \beta = \left[\frac{1}{\sum\left(N_i/Y_i\right)}\right] > 0$$

The change in the per capita share of a state is given by the partial derivative of the share as follows:

$$\frac{\partial b^*}{\partial Y_i} = \frac{\partial\left(\beta/Y_i\right)}{\partial Y_i}$$

$$= \frac{Y_i\left(\frac{\partial\beta}{\partial Y_i}\right) - \beta\left(\frac{\partial(Y_i)}{\partial Y_i}\right)}{Y_i^2}$$

$$= -\frac{\beta}{Y_i^2} \quad \text{..... (14)}$$

While testing progressivity of the method, effect of population has been ignored using partial derivative of per capita share. But the effect of both the variables should be taken into consideration in testing progressivity of the criterion, since these variables differ from state to state. To capture the effect of both these variables, total derivative has been used. In this method, the share of a state in total transfers is

$bi = \beta\left(\frac{N_i}{Y_i}\right)$ as stated in equation (iii) in Appendix IV

When the effect of both these variables are taken into account the change in the share of a state (using total differential) can be estimated as,

$$dbi = d\left(\frac{\beta N_i}{Y_i}\right)$$

$$= \frac{Y_i d\left(\beta N_i\right) - \beta N_i d\left(Y_i\right)}{Y_i^2}$$

$$= \frac{\beta\left(Y_i dN_i - N_i dY_i\right)}{Y_i^2} \quad \text{..... (15)}$$

To arrive at the per capita change in share of a state the above equation is divided by:

$$dbi^* = \frac{\beta\left(Y_i\left(\frac{dN_i}{N_i}\right) - dY_i\right)}{Y_i^2} > 0 \quad \text{..... (16)}$$

The second order derivative of the equation (16), to know the pattern of response of the share, is given as follows.

$$d\left(db_i\right) = d\left(\frac{\beta\left(Y_i dN_i - N_i dY_i\right)}{Y_i^2}\right)$$

$$= \frac{Y_i^2 d\left(\beta\left(Y_i dN_i - N_i dY_i\right) - \beta\left(Y_i dN_i - N_i dY_i\right) d\left(Y_i^2\right)\right)}{\left(Y_i^2\right)^2}$$

$$= \frac{Y_i^2 \beta dY_i dN_i - Y_i^2 \beta dY_i dN_i - \beta\left(Y_i dN_i - N_i dY_i\right) 2Y_i dY_i}{\left(Y_i^2\right)^2}$$

$$= \frac{-2\beta dY_i\left(Y_i dN_i - N_i dY_i\right)}{\left(Y_i^3\right)} < 0 \quad \text{..... (17)}$$

The per capita change of the slope is obtained by dividing the equation (17) by N_i,

$$= \frac{-2\beta dY_i\left(Y_i\left(\frac{dN_i}{N_i}\right) - dY_i\right)}{\left(Y_i^3\right)} < 0 \quad \text{..... (18)}$$

Equation (16 and 18) conforms to all the conclusions of the IDM.

Section III

3.1 Alternative Approach (AA)

In all major methods[25] of devolution, population has been an important factor. When 'population' is being implicit under 'equity principle' and 'fiscal disciple criteria', it affects the basic objective these methods. As per equity principle, 'deficiency in fiscal capacity' should be the base for devolution. However, devolution through this principle gets affected by population, which is implicit. As a result of that states with more population get more proportionate share than states with low population irrespective of their deficiency in fiscal capacity. In other words, the devolution depends on the relative strength of 'population' as well as 'deficiency in fiscal capacity'.

Fiscal imbalances can be minimized when the methods of equity principle satisfy the following norms, (1) progressivity, (2) comprehensiveness, (3) exhaustivity and (4) neutrality for transfer (Rangarajan and Srivastava, 2008, p. 58). Even though the methods are claimed to be satisfying the fundamentals of equity principle, it seems to be partially satisfying two most fundamental norms, (1) progressivity, and (2) comprehensiveness, as observed from the performance of output indicators. It has been reported in the literature that the equity principle is progressive (Srivastava and Aggarwal; 1994, p.453). In order to show the progressive character of the equity principle, population has been treated as 'constant' instead of 'variable'. As a result of that 'equity principle' as well as 'fiscal discipline criteria' ignores the population differential across states. No doubt explicit weightage has been given to population in population criterion; its weightage has been reduced over time (see Table 1 and 2, Appendix I). It has been proved in Part II that the equity principle used in India has been regressive in nature. In order to reduce the fiscal imbalance across states the equity principle must be progressive. An attempt has been made to develop an AA to equity principle which would be progressive in nature testing theoretically as well as empirically. If all states are arranged in ascending order with respect to percentage of per capita income to aggregate per capita income of all states, the share will decline with increase in the rank of state. The AA assumes the percentage of per capita NSDP as the fiscal capacity of a state. The NSDP is the appropriate indicator from welfare point of view due its exclusion of replacement investment (Spant, Ronald; 2003, p.40). The share is determined by the proportion of the reciprocal of percentage of per capita NSDP.

The Steps for the estimation of the share of state are as follows:

(1) Estimate the percentage of per capita income from the total per capita income of all states.

(2) Calculate the reciprocal of respective per cent assuming them as absolute value.

(3) The reciprocal of the percentage (of per capita income) of each state is to be divided by the sum of the same variable and multiply the quotient with total transfer to get the total share of a state.

The share of a state in total transfers is given by

$$ci = \frac{\frac{1}{P_i}}{\sum\left(1/P_i\right)}$$

$$= \gamma / P_i \quad \text{..... (19)}$$

$$\text{Where } \gamma = \frac{1}{\sum\left(1/P_i\right)}$$

Here = P_i= percentage of per capita income of i^{th} state (where i=1.....n) out of the aggregate per capita income of all states participating in the horizontal distribution. If the total amount of transfer to all states is *T*, the total amount of transfer to a state is given by

$$z_i = \frac{\gamma}{P_i} T$$

3.2 Test of Progressiveness

The progressivity of the AA has been tested through total derivative of the share of i^{th} state (equation 19). We thus obtain,

$$dc_i = d\left(\frac{\gamma}{P_i}\right)$$

$$= \frac{P_i \frac{\partial(\gamma)}{\partial P_i} dP_i - \gamma \frac{\partial\left(P_i\right)}{\partial P_i} dP_i}{P_i^2}$$

$$= -\frac{\gamma}{P_i^2} dP_i$$

$$dc_i = -\frac{\gamma}{P_i^2} dP_i \quad \text{..... (20)}$$

In order to know the nature of response of the share, second order derivative of the equation (20) is obtained by

$$d\left(dc_i\right) = d\left(-\frac{\gamma}{P_i^2} dP_i\right)$$

$$= \frac{P_i^{2d}\left(-\gamma dP_i\right) - \left(-\gamma dP_i\right) d\left(P_i^2\right)}{\left(P_i^2\right)^2}$$

$$= \frac{2\gamma \left(dP_i\right)^2}{P_i^3} \rangle 0 \quad \text{..... (21)}$$

The negative sign in the right side of the equation (20) implies that with every unit increase in the percentage of per capita income across states, the change in the share declines. Further the change in share declines at an increasing rate (equation 21) with the rise in the percentage of per capita income.

The per capita change in share of states decreases with an increase in the percentage of per capita income as well as population across states at an increasing rate (equation 22 and 23). This is reflected by,

$$dc_i^* = \frac{dc_i}{N_i} = -\frac{\gamma}{N_i P_i^2} dP_i < 0 \quad \text{..... (22)}$$

Per capita change of the slope of the equation (21) divided by N_i

$$= \frac{2\gamma \left(dP_i\right)^2}{N_i P_i^3} \rangle 0 \quad \text{..... (23)}$$

The increasing rate of inverse relationship of both change in share and per capita change in share with the percentage of per capita income indicates the progressivity of the criterion (equation 20, 21, 22 and 23). The degree of progressivity depends on the percentage of per capita income as well as population. If the population as well as the percentage of per capita income increases across states, the change in per capita share decreases and vice versa. Interestingly, the per capita income is found to be more sensitive than population. The per capita share is likely to decline to a greater extent under a situation of an increasing population and the percentage of per capita income than having constant population and rise in the percentage of per capita income. However this share will rise when the rate of decline in population and the rise in the percentage of per capita income becomes same.

3.3 Other Properties

Apart from the progressivity character, this method also satisfies the comprehensiveness and exhaustivity properties.

It is comprehensive because it assigns a positive share to every state since the reciprocal of their percentage of per capita income is positive ($\frac{1}{P_i} \rangle 0$). Unlike the IDM and FCDM, it does not need adjustment to provide a share for the highest income state. Since the sum of the shares of all states equals to one, the total transfer get exhausted.

Symbolically, $S^* = c_1 + c_2 + \ldots\ldots\ldots\ldots + c_n = 1$ (*Where S* sum of the shares of all states)*

Section IV

4.1 Comparative Empirical Analysis of Income Distance Method and Alternative Approach

The methods of equity principle fail to address the objective which is reflected in the increasing fiscal imbalances in India over years. As discussed earlier (part II) it happens just because the principle does not satisfy fundamental properties necessary to maintain fiscal balance across states. Moreover, an implicit weight of population has been observed in the principle. As a result of that, states with more population get more shares and vice versa, irrespective of deficiency in fiscal capacity (See Table 3)[26]. However, efforts are being made to prove these methods as progressive by ignoring the effect of population in the equation. In order to ensure equality through it, the methods should ensure devolution on the basic of deficiency in fiscal capacity. With this back drop, an AA has been suggested which ensure a fair distribution without any effect of population satisfying properties of progressiveness, comprehensiveness, and exhaustivity. The properties have been tested mathematically in part III[27]. However, as discussed earlier, the methods (IDM, IIM and FCDM) of equity principle do not satisfy the above properties. The properties of the proposed approach are empirical verified here.

For a quick understanding and simplicity, a comparison has been made to examine the properties of IDM and AA[28] taking Share Tax transfer data of Twelfth Finance Commission (TFC) period for 14 major states[29].

Progressivity: It has been observed that the share of transfer increases with every move from less backward to more backward states in AA. However, the share per unit of backwardness remains constant across states (see columns under alternative approach heading of table 2 and 3)[30]. As evidence from equation 20 and 21 the change in per capita share increases at an increasing rate with the fall in the per capita income (fiscal capacity) which leads to progressivity. Against this, the per capita share declines while moving from less backward to more backward states under IDM. Moreover, with the increase in fiscal capacity across states, the per capita share per unit of backwardness has been increasing, which contrast with the fundamental ethos of progressivity principle (see Table 1). The analysis shows that when the per capita NSDP increases from Rs.7228 in Bihar to Rs. 25293 in Haryana the change in per capita share estimated through IDM rises from 13136 rupees to 45968 rupees in 2005-06. The trend remains same for other years.

The AA ensures a distribution of transfer equally across states in proportion to backwardness which reflects increase in change in share at an increasing rate with the rise in the proportion of backwardness. As against this, the change in per capita share increases at a diminishing rate with the decrease in proportion of backwardness in IDM.

Comprehensiveness: There are possibilities of getting zero and/or negative shares by few states by virtue of the loopholes implicit in the existing methods of equity principle. In order to avoid such type of eventualities, responsible institution has undertaken different adjustment measures at different point of time to ensure a positive share to all states[31]. Even after this adjustment, states do not receive their due share (See, Table 2 & 3). However, the mechanism of devolution

under the proposed approach ensures a 'non-zero and non-negative' share to all the states without requiring any adjustment for the state with highest per capita income.

Exhaustivity: So far no observation has been made regarding any problem relating to the exhaustivity property of equity principle in India. Further, both the proposed as well as the existing approach has been satisfying this property (see section 3.2 for an explanation for alternative approach).

Neutrality: (for explanation on neutrality property kindly see foot note 25)

It is expected that, the proposed principle may incentivize to maintain fiscal discipline and population control measures among states. Since the deficiency in fiscal capacity is estimated from the highest or average of three highest per capita incomes, states do not get due share in total transfers. It encourages states with highest per capita income to opt for low tax effort for increasing deficiency in fiscal capacity. In other words, the method discourages state for better tax effort**.** However, as the AA assigns due shares to states in proportion to their backwardness, it does not discourage tax effort. The proposed approach incentivizes to take measure for population control because of the inverse relationship between the share and population. It has been observed that state with more population receives less per capita share than state with less population (See Table 4). It has been found that UP has largest number of population than all other states which receives lowest change in per capita (4926 rupees in 2005-06) share than other states. As contrast to this, under IDM the share of devolution has been influenced by population (sea table 2 and 3).

Table 1: Change in Per Capita share in IDM (in crores) (per unit of backwardness)

HIGS	PNSDP	2005-06	2006-07	2007-08	2008-09	2009-10
Punjab	27213	0	0	0	0	0
Haryana	25293	45968	58828	74112	84705	91333
Maha-rashtra	23004	41807	53504	67404	77039	83067
MIGS						
Tamil Nadu	20159	36638	46887	59069	67512	72795
Kerala	19964	36283	46434	58498	66859	72091
Gujarat	18763	34101	43641	54979	62837	67754
Karnataka	17892	32518	41616	52428	59921	64610
Andhra Pradesh	17105	31088	39785	50121	57285	61768
LIGS						
West Bengal	16577	30127	38555	48572	55515	59859
Rajasthan	13415	24381	31202	39308	44926	48442
Madhya Pradesh	11964	21744	27827	35057	40068	43203
Orissa	10573	19216	24591	30981	35409	38179
Uttar Pradesh	9987	18151	23229	29265	33447	36065
Bihar	7228	13136	16811	21179	24206	26101

Note: HIGS = High Income Group States, MIGS = Middle Income Group States, LIGS = Low Income Group States, PNSDP = Per Capita Net State Domestic Product. PNSDP is the average of PNSDP from 1999-00 to 2001-02 at 1999-00 base prices. The

per capita share is obtained using the income distance method (see equation (i) Appendix II. Then the per capita share has been divided by the total backwardness. The backwardness of the state is estimated as the proportion of the reciprocal of the percentage of PNSDP. In other words, the backwardness is estimated through steps (1) obtain the percentage of per capita income from total per capita income (2) find the reciprocal of each percentage (3) divide the reciprocal of each percentage by its total.

Source: For Per Capita NSDP Accounts of National Income Statistics, 2010, Economic and Political Weekly. For Population figure Census of India, 1971 and shared taxes RBI, website, org.rbi.in[32]

Table 2: Distribution of Per Capita Share of Shared Tax (in crores)

(Per Unit of Backwardness)

	Income Distance Method (per capita share)						**Alternative Approach** (share)				
HIGS	Population	2005-06	2006-07	2007-08	2008-09	2009-10	2005-06	2006-07	2007-08	2008-09	2009-10
Punjab	13551060	3556	4551	5733	6553	7066	43520	55695	70165	80194	86469
Haryana	10036808	3355	4294	5409	6183	6666	43520	55695	70165	80194	86469
Maha-rashtra	50412235	6410	8203	10335	11812	12736	43520	55695	70165	80194	86469
MIGS											
Tamil Nadu	41199168	9579	12258	15443	17651	19032	43520	55695	70165	80194	86469
Kerala	21347375	9694	12406	15629	17863	19261	43520	55695	70165	80194	86469
Gujarat	26697475	10503	13441	16934	19354	20868	43520	55695	70165	80194	86469
Karnataka	29299014	11166	14290	18003	20576	22186	43520	55695	70165	80194	86469
Andhra Pradesh	43502708	11972	15321	19302	22061	23787	43520	55695	70165	80194	86469
LIGS											
West Bengal	44312011	11891	15218	19172	21912	23627	43520	55695	70165	80194	86469
Rajasthan	25765806	12197	15609	19664	22475	24234	43520	55695	70165	80194	86469
Madhya Pradesh	41654119	11961	15307	19284	22041	23765	43520	55695	70165	80194	86469
Orissa	21944615	11613	14862	18723	21399	23074	43520	55695	70165	80194	86469
Uttar Pradesh	88341144	11442	14644	18448	21085	22735	43520	55695	70165	80194	86469
Bihar	56353369	9614	12303	15500	17715	19102	43520	55695	70165	80194	86469

Note: The deficiency in fiscal capacity of all states has been estimated using the fiscal capacity of Punjab as standard fiscal capacity. In order to avoid the zero sharing, the fiscal capacity of Haryana has been used as the proxy for the fiscal capacity of Punjab for estimation purpose. The other components are same as Table 1. The per capita share has been divided by per unit of backwardness as estimated under the method mentioned in the note of Table 1.

Source: Same as Table 1.

Table 3: Distribution of Share of Shared Tax (in crores)

			Income Distance Method					Suggested Method				
	PNSDP	Population	2005-06	2006-07	2007-08	2008-09	2009-10	2005-06	2006-07	2007-08	2008-09	2009-10
Uttar Pradesh	9987	88341144	10828	13857	17457	19952	21513	4643	5941	7485	8555	9224
Bihar	7228	56353369	8013	10255	12920	14766	15922	6415	8209	10342	11821	12745
Maharashtra	23004	50412235	1510	1932	2434	2782	3000	2016	2580	3250	3714	4005
West Bengal	16577	44312011	3354	4292	5407	6180	6663	2797	3580	4510	5154	5558
Andhra Pradesh	17105	43502708	3129	4004	5044	5765	6216	2711	3469	4370	4995	5386
Madhya Pradesh	11964	41654119	4519	5784	7287	8328	8980	3875	4960	6248	7141	7700
Tamilnadu	20159	41199168	2068	2646	3334	3810	4109	2300	2943	3708	4238	4570
Karnataka	17892	29299014	1943	2487	3133	3580	3861	2591	3316	4178	4775	5149
Gujarat	18763	26697475	1605	2054	2588	2958	3189	2471	3162	3984	4554	4910
Rajasthan	13415	25765806	2530	3237	4078	4661	5026	3456	4423	5572	6369	6867
Orissa	10573	21944615	2598	3325	4189	4788	5162	4385	5612	7070	8081	8713
Kerala	19964	21347375	1101	1409	1775	2029	2188	2322	2972	3744	4280	4615
Punjab	27213	13551060	185	237	298	341	368	1704	2181	2747	3140	3385
Haryana	25293	10036808	137	175	221	253	272	1833	2346	2956	3378	3642

Note: The deficiency in fiscal capacity of all states has been estimated using the fiscal capacity of Punjab as standard fiscal capacity. In order to avoid the zero sharing, the fiscal capacity of Haryana has been used as the proxy for the fiscal capacity of Punjab for estimation purpose. The population of states is as per 1971 census and other components are same as Table 1.

Source: Same as Table 1

Table 4: Per Capita share in AA (in cores) (per unit of backwardness)

HIGS	Population	PNSDP	2005-06	2006-07	2007-08	2008-09	2009-10
Punjab	10036808	27213	32115	41100	51779	59179	63810
Haryana	13551060	25293	43360	55491	69908	79900	86152
Maharastra	50412235	23004	8633	11048	13918	15908	17152
MIGS							
Tamilnadu	41199168	20159	10563	13518	17031	19465	20988
Kerala	21347375	19964	20386	26090	32868	37566	40506
Gujarat	26697475	18763	16301	20862	26282	30038	32388
Karnataka	29299014	17892	14854	19009	23948	27371	29513
Andhra Pradesh	43502708	17105	10004	12803	16129	18434	19877
LIGS							
West Bengal	44312011	16577	9821	12569	15834	18098	19514
Rajasthan	25765806	13415	16891	21616	27232	31124	33560
Madhya Pradesh	41654119	11964	10448	13371	16845	19252	20759
Orissa	21944615	10573	19832	25380	31974	36544	39403
Uttar Pradesh	88341144	9987	4926	6305	7943	9078	9788
Bihar	56353369	7228	7723	9883	12451	14231	15344

Note: Same as Table 1.
Source: Same as Table 1.

Section V

5.1 Conclusion

Even if the 'equity principle' has been used with greater emphasis over time to minimize the differences in capacity and need between the same and different levels of government in India, the problem is not being resolved properly. It may be due to either problem associated with the devolution through other than equity principle or equity principle. Apart from other reasons, the influence of population factor as well as the use of deficiency in fiscal capacity based norm in the methods of equity principle restricts to achieve the objective of the principle. It leads to the continuous increase in the horizontal inequality which in turns rises the vertical fiscal imbalance. If this trend persists over time the macroeconomic stability as well as the microeconomic efficiency will be unsustainable. In order to keep away from the possibility of above unsustainability remedial measures have to be searched for. At this back drop, the present paper is an attempt to prescribe an alternative approach which may be helpful in reducing the horizontal as well as vertical imbalance which in turn keeps the economy away from the unsustainability.

The alternative approach based on the percentage of per capita income is away from the shortcomings of the existing equity principles without using population and standard fiscal capacity in the estimation of the deficiency in fiscal capacity. It has been examined mathematically and empirically which reveals the fulfillments of the properties of the equity principle. If this

approach will be adopted there is the possibility of reduction of inequality in a better way than the existing methods.

Appendix I

Table 1: Distribution of Income Tax (In percent)

FC	POP	CON	DM	IM	TE	PP	IB
1st	80	20	-	-	-	-	-
2nd	90	10	-	-	-	-	-
3rd	80	20	-	-	-	-	-
4th	80	20	-	-	-	-	-
5th	9	10	-	-	-	-	-
6th	90	10	-	-	-	-	-
7th	90	10	-	-	-	-	-
8th	22.5	10	45	22.5	-	-	-
9th_1	25		50		12.5	12.5	
9th_2	22.5	10	45	11.25	-	-	11.25

Notes: FC = Finance Commission, POP=population, CON=contribution, DM=distance method, IM=inverse income method, TE=tax effort, AR=area, FD=Fiscal Discipline, IF=infrastructure, IB= index of backwardness, PP = Proportion of poor in total number of poor.

Sources: Om Prakash, at el. 2003, Appendix I and II, Page: 139-42, V.P.Tripathy, at el. 2003, Page: 165 and 9th -1 FC Report, Srivastava (2003), page.7.

Table 2: Distribution of Union Excise Duties (In percent)

FC	POP	CON	DM	IM	IB	OTH
1st	100	-	-	-	-	-
2nd	90	10	-	-	-	-
3rd	MF	WNA	-	-	-	-
4th	80	-	-	-	20	-
5th	80	-	-	-	6.3	13.7
6th	75	-	25	-	-	-
7th	25	-	-	25	-	50
8th	25	-	50	25	-	-
9th-1	25	-	50	12.5	12.5	-
9th-2	25	-	50	12.5	12.5	-

Sources: Same as Table 1.

Table 3: Distribution of Shared Taxes (In percent)

FC	POP	DM	AR	IF	TE	FD
10th	20	60	5	5	10	-
11th	10	62.5	7.5	7.5	5	7.5
12th	25	50	10	-	7.5	7.5
13th	25	47.5	10			17.5

Sources: For 10th FC Om Prakash, at el. 2003, Appendix I and II, Page: 139-42. For 11th and 12th FC; Indira Rajaraman at el.2005, Table 6 and Page: 3417, For 13th FC Srivastava, 2010, Table 2, Page: 65.

Table 4: **Gadgil Formula for Non-Special Category State (in Percent)**

Year	POP	DM	IIM	TE	IP	SP	FD	NO
1969-80	60	-	10	10	10	10	-	-
1980-91	60	-	20	10	-	10	-	-
1991 onwards	60	5	20	2.5	-	7.5	2.5	2.5

Notes: POP = Population, IIM = Inverse Income Method, TE = Tax Effort, IP = Irrigation and Power Projects, SP = Special Problems, FD = Fiscal Discipline, NO= National Objectives and DM = Distance Method.

Sources: Deepali Pant Joshi, 2003

N.B: The fiscal management is the difference between state own total plan resources at the time of finalizing annual plan and their actual performance considering latest five years. National objectives included four objectives. They are population control, elimination of illiteracy, on time completion of externally aided projects and success in land reform measures. The special problems included seven special problem areas. They are coastal areas special environment issues, flood and drought prone areas, exceptionally spares thickly populated areas, special financial difficulties for achieving minimum reasonable plan size, desert problems slums in urban areas.

Table 5: Horizontal sharing of shared taxes in Finance Commission Awards

(Per cent)

Group of states	VI FC	VII FC	VIII FC	IX-1 FC	IX-2 FC	X FC	XI FC	XII FC
High	20.1	18.4(-1.7)	15.5(-2.9)	15(-0.5)	15.4(0.4)	14.6(-0.8)	10.6(-4.0)	11.7(1.1)
Middle	35.0	35.0	34.4(-0.6)	33.7(-0.7)	34.3(0.6)	34.7(0.4)	30.9(-3.8)	28.7(-2.2)
Low	44.9	46.6(1.7)	50.1(3.5)	51.3(1.2)	50.3(-1.0)	50.6(0.3)	58.6(8.0)	59.6(1.0)

Note: FC stands for Finance Commission and Values in the parentheses are the gain and loss of transfers
Source: From VI to IX- 1 FC Reserve Bank of India, Bulletin Various Issues.
From IX-2 to XII FC RBI, website

Table 6: Distribution of per capita NSDP (per cent)

Group of states	VI FC	VII FC	VIII FC	IX-1 FC	IX-2 FC	X FC	XI FC	XII FC
High	39.00	39.0	38.6 (-0.33)	40.0(1.4)	40.4(0.4)	39.7(-0.7)	37.6(-2.1)	41.2(3.6)
Middle	33.4	33.5(0.1)	34.0(0.5)	33.4(-0.6)	34.3(1.1)	36.8(2.5)	35.7(-1.1)	38.2(2.5)
Low	27.56	27.4(-0.2)	27.3(-0.1)	26.5(-0.7)	25.2(-1.3)	23.5(-1.7)	26.7(3.2)	20.6(-6.1)

Note: FC stands for Finance Commission and Values in the parentheses are increase and decrease in the % of per capita NSDP.
Source: National Account Statistics, 2010, Economic and Political Weekly.

Appendix II

Income Distance Method

In the income distance method, the share of transfer of the sample state is the ratio of the deficiency in the fiscal capacity of the sample state to sum of the deficiencies in fiscal capacity of all states taken together.

Symbolically,

$$A_i = \frac{\left(Y_s - Y_i\right) N_i}{\sum \left(Y_s - Y_i\right) N_i} \quad \text{.....} \quad \text{(i)}$$

Here, and

Where, $i = 1, 2, 3.....n$; and $Y_s > Y_i$

i = *Number of states participating in horizontal distribution of transfers arranged in ascending order.*

A_i = Share of a state in total federal transfers

N_i = Population of state

Y_s = Standard per capita income

Y_i = Per capita income of state

Since $\frac{1}{\sum (Y_s - Y_i)N_i}$ is constant the equation (i) can be written as

$\alpha(Y_s - Y_i)N_i$ ..... (ii)

here $\alpha = \frac{1}{\sum (Y_s - Y_i)N_i}$

When the total transfers to all state is '*T*', the total amount of transfer to state would be,

$Z_i = \alpha\left(Y_s - Y_i\right) N_i T$ ..... (iii)

Per capita share of a state can be obtained by dividing eq. (ii) with total population of the respective state (N_i).

$$a^*_i = \frac{A_i}{N_i}$$

$$= \frac{\alpha(Y_s - Y_i)N_i}{N_i}$$

$$= \alpha(Y_s - Y_i) \text{ ..... (iv)}$$

This criterion satisfies the equity and neutrality properties since the deficiency in fiscal capacity of a state is measured by the differences in the standard per capita income and per capita income of the sample state. The principle of equity is satisfied when two sates with equal criterion value are treated equally and with different criterion value treated differently. The neutrality property satisfies when the transfers of an undivided state equal to the sum of transfer of two divided states. The comprehensiveness property satisfies when all the participants should get a positive share (for detail see Rangarajan and Srivastava, 2008, p.58). However, it is not comprehensive since it does not provide a positive share to the state having highest per capita income. As the share of state having highest per capita income is estimated to be zero, it is adjusted by taking the difference from state having the next highest per capita income figure.

Appendix III

Fiscal Capacity Distance Method

According to the Fiscal Capacity Distance Method the share of a general category state can be written as:

$$S_i = \frac{N_i\left(ay^* - a_g y_i\right)}{\sum N_i\left(ay^* - a_g y_i\right) + \sum N_i\left(ay^* - a_s y_i\right)}$$

$$= \alpha N_i\left(ay^* - a_g y_i\right) \quad \text{..... (i)}$$

Here, $\alpha = \frac{1}{\sum N_i\left(ay^* - a_g y_i\right) + \sum N_i\left(ay^* - a_s y_i\right)}$

Where,

i = 1.....$m$for general category states and

$i = m + 1$.....n for special category states.

a = Average Tax-GSDP ratio of all states

a_g = Average Tax-GSDP ratio of general category states

a_s = Average Tax-GSDP ratio of special category states

N_i = Population of the state (applicable for both general as well as special category states)

Y_i = Per Capita Income of state (applicable for both general as well as special category states)

Y^* = Standard Per Capita GSDP

The share of the special category states is given by,

$$S_i = \frac{N_i(ay^* - a_s y_i)}{\sum N_i\left(ay^* - a_g y_i\right) + \sum N_i\left(ay^* - a_s y_i\right)} \quad \text{..... (ii)}$$

$$= \alpha N_i\left(ay^* - a_s y_i\right) \quad \text{..... (iii)}$$

Appendix IV

Inverse Income Method

According to the Inverse Income formula, the share of a state is given by

$$b_i = \frac{\left(Y_s/Y_i\right)N_i}{\sum N_i\left(Y_s/Y_i\right)} \quad \text{..... (i)}$$

i = 1, 2,3,……n.

Or $bi = \frac{(N_i/Y_i)}{\sum(N_i/Y_i)}$ ..... (ii)

Both Equation (i) and (ii) have been used as Inverse Income formula/method in different countries. However, India follows the (ii) equation as the Inverse Income formula for devolution.

Since, $\frac{1}{\sum(N_i/Y_i)}$ is constant the equation (ii) is reduced to

$$b_i = \beta(N_i/Y_i) \quad \text{..... (iii)}$$

Where $\beta = \frac{1}{\sum(N_i/Y_i)}$

The per capita share of a state is given by dividing eq (iii) by N_i

$$b_i^* = \frac{b_i}{N_i} = \frac{\beta(N_i/Y_i)}{N_i} = \beta/Y_i$$

$$b_i^* = \beta / Y_i \quad \text{..... (iv)}$$

The total amount of transfer to a state is given by

$$Z_i = \frac{\beta N_i}{Y_i} T \quad \text{..... (v)}$$

Where = the total amount of federal transfers to states participating in horizontal distribution of transfer.

This formula is also able to exhausts the total transfers among all states participating in horizontal distribution and neutral in character. However, it provides more transfers to the high income group states relative to the distance formula. This formula was initially used by both Finance Commission as well as the Planning Commission. But after the 9th FC it has been used by the Planning Commission only.

Although all methods are different with respect to their process of estimation all them implicit the weight of population and distribute transfers inequitably. Thus there is a need to look into the ingredients of these principles.

Appendix V

Table 1: Population of Fourteen Major States (in crores)

States	Average	Proportion of Lowest State
HIGS		
Gujarat	42813846	2.5
Haryana	17322424	1.0
Maharashtra	81175927	4.7
Punjab	20811219	1.2
MIGS		
Andhra Pradesh	65873789	3.8
Karnataka	45448917	2.6
Kerala	28798621	1.7
Tamil Nadu	55849392	3.2
West Bengal	68464194	4.0
LIGS		
Bihar	91285275	5.3
Madhya Pradesh	67857424	3.9
Orissa	31978847	1.8
Rajasthan	46117690	2.7

Note: HIGS = High Income Group States, MIGS = Middle Income Group States and LIGS = Low Income Group States and Estimation based on mid-year population. The average has been taken from 1972 to 2010.

Sources: Census of India 1971, 1981, 1991 and 2001

Appendix VI

Distribution of Per Capita Share and Change in Per Capita Share of Shared Tax during 12th FC in IDM

	Per Capita Share					Change in per capita share (proportion of per capita income)				
HIGS	2005-06	2006-07	2007-08	2008-09	2009-10	2005-06	2006-07	2007-08	2008-09	2009-10
Punjab	137	175	220	252	271	137	175	220	252	271
Haryana	137	175	220	252	271	137	175	220	252	271
Maha-rashtra	300	383	483	552	595	137	175	220	252	271
MIGS										
Tamil Nadu	502	642	809	925	997	137	175	220	252	271
Kerala	516	660	832	950	1025	137	175	220	252	271
Gujarat	601	769	969	1108	1195	137	175	220	252	271
Karnataka	663	849	1069	1222	1318	137	175	220	252	271
Andhra Pradesh	719	920	1160	1325	1429	137	175	220	252	271
LIGS										
West Bengal	757	969	1220	1395	1504	137	175	220	252	271
Rajasthan	982	1256	1583	1809	1951	137	175	220	252	271
Madhya Pradesh	1085	1389	1749	1999	2156	137	175	220	252	271
Orissa	1184	1515	1909	2182	2352	137	175	220	252	271
Uttar Pradesh	1226	1569	1976	2259	2435	137	175	220	252	271
Bihar	1422	1820	2293	2620	2825	137	175	220	252	271

Note: PPCI: Proportion of per capita income,
Sources: Same as table 1 of the text.

1. High income inequality has been observed across Indian states. The income inequality between the highest and lowest per capita income states is estimated in the ratio of 4:1. In addition to it, a significant variation (Co-efficient of Variation 33 per cent) in per capita income across 14 Major states has been observed (for this analysis data has been used from1980-81 to 2009-10). Elsewhere, it has also been argued that there is a 10: 1 ratio between the per capita income of the highest and the lowest income states. This estimates is based on the average comparable per capita GSDP figure from 2004-05 to 2006-07 for all states and UTs. (See, 13th Finance Commission Report, Chapter 8, Para 8.30, p.120).
2. This principle has been criticized on the ground of (1) implicit weight of population in the method and (2) use of standard fiscal capacity to estimate the deficiency in fiscal capacity. The implicit population assigns more shares to populous states while the use of standard fiscal capacity does not allow the richer states in getting their due share. As a result of this instead of reducing, inequality widen across states.
3. The efficacy question of equity principle has been debated in the literatures. One view supports the use of the principle due to their confidence in 'inequality reducing capacity' of the principle (Rao and Chelliah 1996, p 23). It has been argued by others that the use of the deficiency in fiscal capacity based norm in the above principle discourages tax effort among states. However, it is further argued that to compensate this adverse affect of the principle it should be supplemented with the efficiency criteria (Chaubey, 2003; p.33). The simultaneous use of equity and efficiency criteria has been criticized on the ground of their contradicting in nature. When the equity principle encourages to increase the revenue and expenditure gap of states the fiscal discipline criteria advocates to limit the gap. Elsewhere it has been observed that due to the simultaneous use of both criteria the poorer states have been suffered (Chakraborty 2010, pp 57-58).
4. Rest 57.6% of the total formula based transfer is distributed on the basis of population (30.5%), area (7.5%), fiscal discipline (12.7%), special problems (1.5%) and other (5.4%) criterion.
5. The rest 53% of FC formula based transfers is transferred through neutral and fiscal discipline criteria and gap filling approach. However these transfers have nothing to do with the principle of equity. The remaining 75% of

formula based transfer of PC is distributed through population, tax efforts, special problems national objective, fiscal discipline and poverty index. Total formula based transfer constitutes 83 % of total federal transfers. The rest 17% of total transfer are distributed discretionarily. Here, total has been estimated based on transfers to 14 non-special category major states. The total FC and PC formula based transfers are 81% and 19% of formula based transfers respectively. The total FC formula based transfers are 67% of total federal transfers. For the distribution of the rest 75% of PC, see Appendix I, Table 4.

6. The neutral criteria are Population and Area criterion while Tax effort, and Own revenue performance are the fiscal discipline criterion.
7. According to equity principle, transfer should be given on the basis of deficiency in fiscal capacity of states. The fiscal capacity of a state is determined by per capita income, distribution of income, per capita consumption expenditures, sectoral composition of income, extent of urbanization, and level of development (for detail see Rao, H. 1993). The per capita income has been used as the proxy indicator of fiscal capacity in the equity principle for devolution of transfers because it is the only indicator which can better reflect the fiscal capacity of states as compared to other indicators mentioned above.
8. When Horizontal Imbalance is removed Vertical Imbalance ractifies since both are supplementary and complementary to each other. It is because when the horizontal imbalance is reduced the transfer needed for the central government for its rectification also diminishes.
9. The weight of the equity principles has been increasing over time from 22.5% to 62.5% in case of FC and from 10% to 25% in PC (See Appendix I; Table 1, 2, 3 and 4).
10. For detail see Appendix 1 Table 1 and 2.
11. The FC drops using IIM for transferring of resources since 10th FC because of the regressive nature of the formula (See Kumar, T. Ravi 2001, p.4673).
12. A marginal weight of 5% was given to IDM in the modified Gadgil formula of 1991.
13. Devolution has been made on the basis of deficiency in fiscal capacity to bring equality across states under this principle.
14. Even though the objective is same with the earlier principle, this principle has seldom to do with deficiency in fiscal capacity. It follows a set of different norms to bring equality across states which has serious methodological constraint and influenced by political decisions. Therefore equity principle is the only hope.
15. For details see Appendix I: Table 5 & 6.
16. A criterion is said to be progressive when higher proportionate share is transferred to states with lower per capita fiscal capacity than state with higher per capita fiscal capacity and vice versa. In other words, progressivity requires holding of an increasing rate of inverse relationship between per capita fiscal capacity and transfer. If devolution through equity principle is progressive, then the probability of provisioning of common minimum level of public goods per unit of tax may be ensured throughout the nation. Contrary to this, higher per capita share of transfers to state with high per capita fiscal capacity and the vice versa is said to be regressive.
17. While the FC has been constitutionally assigned the duty of mediating transfers under article 280 of the Indian constitution, the PC has transferred with the direction of central government misinterpreting the article 282, meant for transfers for public purposes during emergencies (Rao and Sen, 1996, p. 135).
18. Relative deficiency of fiscal capacity of states has been used as the basis for determining the share of transfers. According to the IDM, the per capita income has been used as the indicator of the fiscal capacity of a state. The difference between standard per capita income and the per capita income of a state is the per capita deficiency in fiscal capacity of a state. Both average of GSDP and NSDP has been used by different FC periods as the proxy for the per capita figure. During 8th, 9th and 10th FCs per capita NSDP and during 11th and 12th FC period per capita GSDP has been used as the proxy of fiscal capacity or per capita income. Coming to standard per capita income, per capita income of state with highest per capita income (per capita income of Punjab) is used as standard per capita income during 8th, 9th and 10th FC periods. However, during 11th and 12th FC periods the average of three highest per capita income states has been used as standard per capita income. The deficiency in fiscal capacity of a state is the sum of the differences of all people of the sample states. The share of transfer of the sample state is the ratio of the deficiency in the fiscal capacity of the sample state to sum of the deficiencies in fiscal capacity of all states taken together. For details see Appendix: II
19. The proportion of backwardness is estimated by dividing the reciprocal value of 'percentage of per capita income' with the sum of the reciprocal of all states.
20. The high income states have been demanding for more shares as they have been assigned proportionately low share as compared to middle and low income states (Tripathy, et. al., 2003, p. 158). It has also been argued that

due to greater weightage (62.5%) assigned to the IDM the relatively rich states have been adversely affected (Bhargava, 2003, p. 120)

21. The relative strength is the % change in per capita share due to % change in the proportion of variable under consideration.
22. See Appendix V, Table 1.
23. The FCDM is a modified version of IDM introduced during the 13th FC. When the later uses per capita income differences as the deficiency in fiscal capacity of a state, the former uses differences in average tax effort. Two different average tax efforts (2004-07) have been used for special and general category states in estimating the distance of fiscal capacity of state from the highest fiscal capacity. It is because a single average of tax-GSDP of two different sets of states with high differences in sectoral composition may not indicate the exact fiscal capacity distance. The per capita taxable capacity of a state has been estimated by multiplying the average tax GDP ratio of the category which it belongs to with the GSDP of the sample state. The share of a general category state is estimated by the sum of differences between 'standard per capita taxable capacity and the per capita taxable capacity of sample state' divided by the sum of differences of all general category and special category states. Similar is the case for special category states. For detail derivation see Appendix III.
24. See equation (iii) of Appendix III.
25. In neutral criteria and tax effort criterion, transfers are determined solely on the basis of the variable that corresponds to their objective. However, in equity and fiscal discipline criteria transfers are calculated on the basis of the variable that fits to the objective as well as the objective deterring variable. The major methods in which population used as objective deterring variable are 'Population criterion' (explicit), 'equity principle' and 'fiscal discipline criterion'.
26. It has been estimated that even if the per capita income of UP (9987) is greater than Bihar(7288), Maharastra (23004) from Karnataka (17892), WB (16577) from Rajasthan (13415) and Orissa (10573), AP (17105) from Rajasthan and Orissa, MP(11964) from Orissa and Tamilnadu (20159) from Karnataka, Gujarat (18763) and Kerala (19964), these states receive more shares than their counterpart due to their more shares of population.
27. Even though neutrality property is equally important to maintain horizontal equity, we did not emphasize on it for following reasons: (i) the process of division of states is constitutionally cumbersome, and (ii) the frequency of occurrence of such type of event is rare.
28. It has been verified that IIM, FCD Method and IDM have almost similar characteristics. IDM has been (out of three methods) chosen for testing because it has been used as the oldest method of devolution, it is more appreciated as compared to IIM (Srivastava and Aggrawal, 1994; p.450) and FCDM (Srivastava 2010, p.70) for its progressive character, it cover a significant proportion (90.8% during 12th finance commission period) of equity based transfer and it has been recognized by the constitutional body (FC).Even if FCDM is also recognized by FC, it is simply a modified version of IDM.
29. Share tax has been chosen for the estimation purpose because it constitutes a significant proportion (88.5% during 12th Finance Commission period) of equity based transfer. Further, 12th FC period Share Tax has been used for this analysis just for simplicity. Data used for any Finance Commission period will lead to almost similar conclusion with a marginal variation in the absolute figure. However, the basic structure of the outcome will remain almost the same.
30. The same conclusion follows if the estimation of deficiency in fiscal capacity is made from a standard per capita income comprising of average of first three highest per capita incomes.
31. The method adopted during 8th, 9th and 10th FC period for devolution of share across states there was possibilities of assigning 'zero share' to state with highest per capita income. In order to avoid this, certain modification measure has been adopted by the FC to ensure a positive share to all states. Instead of taking the deficiency in fiscal capacity of state with highest per capita income, deficiency in fiscal capacity of state with next highest per capita income has been used as the proxy for the state with highest per capita income (for detail see foot note 16). During 11th and 12th FC period the method was changed for devolution. Instead of resolving the 'zero share' problem, it further enters into a similar type of problem where there was a possibility of getting even negative share by few states. In order to avoid this, a fraction of deficiency in fiscal capacity of 4th highest per capita income state has been used as the proxy for the deficiency in fiscal capacity of three highest per capita income states to ensure a positive share to all. Even though the same method as that of 11th and 12th FC was followed in 13th FC to avoid the problem, a different adjustment mechanism was followed by allotting a fixed per capita share to three highest per capita income states (for detail see foot note 16).

32. The states have been divided into HIGS, MIGS and LIGS on the basis of average per capita NSDP of three years from 1999-00 to 2001-02 of fourteen major states. The states which have fallen below the average are included in LIGS, the states which fall below the average of the rest states in MIGS and the rest in HIGS. The distance of Punjab has been taken from the per capita income of Haryana. The change in per capita share per unit of backwardness has been estimated dividing the per capita share in proportion to per capita income by the unit of backwardness of the state.

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