Impact of Intergovernmental Transfers on Local Spending Decisions in India: The Flypaper Effect

Kausik K. Bhadra
Project Associate
National Institute of Public Finance and Policy
New Delhi, India
E-mail: kaushik.bhadra@nipfp.org.in / eco.kaushik@gmail.com

Abstract

The flypaper effect results when intergovernmental fiscal transfer leads to significantly greater local level spending than an equivalent rise of own income: money sticks where it hits. Abysmally low fiscal autonomy ratio of the local level governments have made them highly transfer dependent. Relating to this, we have empirically tested whether bureaucrats maximise budgets or transfers have greater stimulatory effect on local public spending using dynamic panel models. The results however in all the models overwhelmingly support the occurrence of the flypaper effect across fourteen states in India since the transfers have significantly greater stimulatory impact on the local spending decisions than the own revenue. However, the structure of intergovernmental transfers in India does not have an incentive effect; thereby states and subsequently local governments do not put efforts to exploit their tax potential to the fullest, although transfers have not made them less active in mobilising their own revenue.

JEL Classifications: H11, H72, H77

Keywords: Dynamic panel model, Flypaper effect, Intergovernmental transfers, Local public spending.

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1: Introduction

The flypaper effect results when intergovernmental fiscal transfer leads to significantly greater local level spending than an equivalent rise of own income: Money sticks where it hits. It denotes that a certain amount of unconditional fiscal transfers to a beneficiary lower government has greater stimulatory effect on increase in the level of local public spending comparatively more than the increase in local income of that equivalent size. The flypaper effect essentially examines the performance of fiscal decentralisation – impact of fiscal transfers - especially with respect to the functioning of its local governments.

The predominant role of fiscal decentralisation is to bring equality for lagging regions through fund devolution. Intergovernmental fiscal transfers thus have a foremost function for enhancing the fiscal autonomy of sub-national levels in meeting expenditure requirements. In India, the two types of funds (i.e. conditional and unconditional) are being devolved to three institutions, which are: Planning Commission, Finance Commission and various central ministries and departments. The structure of these transfers is intended to bring equality for lagging regions and public service delivery through creating incentives for sub-national tiers of government. However, the majority of the local governments find that revenue base is inadequate and highly incompatible with their expenditure targets and responsibilities. Their fiscal autonomy ratio (own revenue as a percentage of total expenditure) is abysmally low while local policy makers / politicians have a predominant role on efficient public service delivery, thereby making them
reliant on fund devolution. In this regard, untied transfers is an imperative instrument since it simply enhance the recipient governments’ fiscal autonomy while tied grants ensure some critical public service delivery of merit goods. Conceptually, the untied transfers can have a greater stimulatory impact on local public spending. Relating to analyse empirically such impact of untied transfers, the ‘flypaper effect’ is an important empirical approach that has evolved in last two decades.

Two anomalies are possible while empirically attempting the ‘flypaper effect’. One, we cannot distinguish whether the flypaper is the outcome of political economy aspects of citizen’s voting patterns or the related bureaucratic behaviour of the local level economic agents (Niskanen, 1968; McGuire, 1975; Dunleavy, 1991; Bradford and Oates, 1971). Two, it can encounter the problems of simultaneity bias, if intergovernmental fiscal transfers can be correlated with the error term which can lead to a downward bias in the coefficients of income effects and an upward bias in the estimates of fiscal-transfer effects. The theoretical issues relate to the former constitutes the analytical framework of the paper, while the latter has been tackled in the paper by using an advanced GMM methodology of dynamic panel data analysis. The paper is organised into 5 sections. Section 2 deals with the analytical framework of the paper while section 3 establishes a mathematical model of the flypaper effect in Indian context. Section 4 surveys the literature and identifies the paucities in empirical literature. Section 5 interprets the data while section 6 specifies the econometric model and interprets results. Section 7 concludes.
2: The Theoretical Framework

The *Budget-Maximising Model*, introduced by Niskanen (1968) argues that the government officials are the budget maximisers; hence they conceal the information regarding the actual level of grants that have been allocated to the beneficiaries. The bureaucrats seek a vote from the citizens by inventively through promising for future work using this obscured information since the citizens are unacquainted about the true budget allocations for them. Later, McGuire (1975) provided the *Greedy Politicians Model*, which is, in essence, similar to Niskanen’s model. The author argued that the local politician utilises funds to ensure their political survival. In other words, they use money with the intention of making their welfare. However, arguments relating to the role of bureaucrats and the impact of fiscal illusion through information asymmetry created by the bureaucrats have been made to explain the flypaper effect. In this regard, Oates (1979) has given a model to explain the flypaper effect based on the postulation of fiscal illusion. Voters are given a partial part of the fiscal information while making their decisions. On receipt of the untied funds, the authority either could pass it on to the voters as an increase in income or the authority could simply aim to deliver the intended services at a lower subsidised price. In either case, the public spending would increase but only the difference is the former effect depends upon the income elasticity of demand while the later explains the impact on local spending hinge on the price elasticity of demand. However, as a response to the Niskanen’s model, Dunleavy (1991) introduced the *Bureau-Shaping Model*, which
argues that rational public bureaucrats would not prefer to maximise budgets and would utilise the amount for effective service delivery.

The equivalence theorem in theory of public choice and intergovernmental grants suggests that spending of local government would have an identical increase in two scenarios: one, unconditional fund devolution would stimulate local spending and second, if central government cuts taxes then that would give an increase in voters’ income, which would in turn, boost their purchasing power, thereby local government spending would increase. Bradford and Oates (1971) had also showed that an equivalent increase in disposable income of median voter has exactly the same impact as a grant of the same amount of local government expenditure. Romer and Rosenthal (1980) found that the effect of an increase in grants is even less than the equivalent increase in median voter income. The authors argued that local bureaucrats preclude voters from learning about the intergovernmental transfers, which is being driven by their welfare making motives. In contrast, the flypaper effect, which refers to an empirically tested phenomenon, contradicts such equivalence theorem. This equivalence theorem and the flypaper effect both are shown in Figure 1.

Figure 1 demonstrates the likely effects of intergovernmental fiscal transfers and disposable income of median voter on local government expenditure. The x-axis represents the local public spending while y-axis stands for the disposable income of median voter. The pre-grant budget line i.e. AC, shifts to the post-grant budget line BD after receiving a general lump-sum grant of CD. Consequently, given the new indifference curve IC₂, the new optimal solution is established at the point
of tangency e₂, shifted from e₁. An equivalent increase in the disposable income of median voter of AB, the impact on local government spending would be exactly same as the lump-sum grant of same amount since this would also shift the budget line to BD with the equilibrium at e₂. This is referred to as the equivalence theorem, proposed by Bradford and Oates (1971).

The flypaper effect, however, contradicts this equivalence theorem. The income consumption path (ICP), which shows the locus of consumption choices, represents the impact of an increase in median voter income on local public


Figure 1: Likely Effects of Intergovernmental Fiscal Devolution
spending whereas the grant consumption path (GCP) represents the flypaper effect, which states that a certain amount of untied transfers has greater stimulatory effects on local public spending than an equivalent increase in disposable income of median voter, \( X_3 \) being greater than \( X_2 \). As long as GCP resides below ICP, the impact of an increase in the grant on local public spending remains greater than the similar amount of increase in disposable income of median voter, which holds the flypaper effect.

**3: The Mathematical Approach**

The flypaper effect denotes that the local government expenditure is more responsive to an amount of increase in intergovernmental transfers than the equivalent increase in voters’ income. However, the hardest data to gather is the median voters’ income. We have therefore, used own revenue as a proxy for median voters’ income in a sense that cutting down of income tax rates by central governments would give an extra income to the citizens which would raise their purchasing power, in turn, local level governments’ tax revenue would increase. Based on this approach, we have assumed a Cobb-Douglas production function to mathematically illustrate the abovementioned analytical framework.

The local government maximises

\[ f(r, t) = r^\alpha t^\beta \]  

subject to the budget constraints

\[ r + t = e \]  

\[ r \geq 0 \]
where \( e \) is the local government expenditure, \( r \) and \( t \) stand for own revenue and intergovernmental transfers, respectively.

We use the ‘Lagrangian multipliers’ method for the solution of this constrained maximum. By taking the Lagrange multiplier \( \lambda \), the Lagrangian function for this problem is

\[
L(\lambda_1, \lambda_2, \lambda_3, r, t) = r^\alpha t^\beta - \lambda_1 (r + t - e) - \lambda_2 r - \lambda_3 t
\]  

(3)

To obtain the first order necessary conditions, we have used Karush–Kuhn–Tucker (KKT) conditions of \( L \) with respect to \( r \), \( t \) and \( \lambda \) to zero. The KKT conditions are as follows

\[
\frac{\partial L}{\partial r} = \alpha t^\beta r^{\alpha-1} - \lambda_1 - \lambda_2 = 0
\]  

(4a)

\[
\frac{\partial L}{\partial t} = \beta r^\alpha t^{\beta-1} - \lambda_1 - \lambda_3 = 0
\]  

(4b)

\[
\frac{\partial L}{\partial \lambda_1} = r + t - e = 0
\]  

(4c)

\[
\frac{\partial L}{\partial \lambda_2} = r \geq 0
\]  

(4d)

\[
\frac{\partial L}{\partial \lambda_3} = t \geq 0
\]  

(4e)

Now the complementary slackness conditions are as follows:

\[
\lambda_2 \geq 0, \quad \lambda_2 = 0 \quad \text{if} \quad r > 0
\]  

(5a)

\[
\lambda_3 \geq 0, \quad \lambda_3 = 0 \quad \text{if} \quad t > 0
\]  

(5b)

In order to determine the solution for this maximising problem, we now examine each likely cases where the inequality constraints are binding or not
binding. Since there are two constraints while each can be binding or not binding, we have four cases to consider, which are as follows:

**Case 1:** \( r = 0, \ t = 0 \)

In this case, we cannot satisfy the condition because of both the \( r \) and \( t \) are equal to zero. Hence, i.e., local government expenditure becomes zero. This case is unrealistic in nature since local public spending cannot be zero.

**Case 2:** \( r = 0, \ t > 0 \)

In this case, from the complementary slackness condition (Equation 5b), we get,

\[ \lambda_3 = 0 \]

Now putting the value of \( \lambda_3 \) in equation 4b we get,

\[ \lambda_1 = 0 \]

**Case 3:** \( r > 0, \ t = 0 \)

In this case, from the complementary slackness condition (Equation 5a), we get,

\[ \lambda_2 = 0 \]

Now if we put the value of \( \lambda_2 \) in equation 4a then we get,

\[ \lambda_1 = 0 \]

From conditions 4a, 4b and 4c; we have shown that

\( \lambda_1 = 0, \ \lambda_2 = 0, \ \lambda_3 = 0 \)

**Case 4:** \( r > 0, \ t > 0 \)

In this fourth case, the complementary slackness conditions from the equations 5a and 5b imply that

\( \lambda_2 = 0, \ \lambda_3 = 0 \)

If we put these values of \( \lambda_2 \) and \( \lambda_3 \) in equation 4a and 4b respectively, we get,
\[ \lambda_1 = \alpha t^\beta r^{\alpha-1} \]

and,
\[ \lambda_1 = \beta r^\alpha t^{\beta-1} \]

Therefore, we obtain,
\[ \alpha t^\beta r^{\alpha-1} = \beta r^\alpha t^{\beta-1} \]

Or,
\[ \frac{\alpha}{\beta} = \frac{r}{t} \] (6)

From our budget constraint \( r + t = e \); we can get,
\[ r = e - t \]

Now we put the value of \( r \) in equation 6 we obtain,
\[ \frac{\alpha}{\beta} = \frac{e - t}{t} \]

Or,
\[ \frac{\alpha + \beta}{\beta} = \frac{e}{t} \] (7)

Similarly, we can also show that
\[ \frac{\alpha + \beta}{\alpha} = \frac{e}{r} \] (8)

Based on the fact that across states in India, the volume of transfers is considerably greater than own revenue including tax and non-tax, we have assumed that the coefficient of transfers \( (\beta) \) is greater than the coefficient of own revenue \( (\alpha) \).

If we assume that \( \beta = 4 \) and \( \alpha = 2 \) and put these values in equation 7, we get,
\[ \frac{2 + 4}{4} = \frac{e}{t} \]

Or,
\[ e = 1.5 t \] (9)

Now, we put these values in equation 8, we get,
The equations 9 and 10 explicate the ‘flypaper effect’. An amount of local government spending increases with the increase of intergovernmental transfers by 1.5 units while a greater amount (3 units) of increase in own revenue stimulates the similar amount of local spending.

4: Selected Empirical Literature on Flypaper Effect

Contrary to the classical model of equivalence theorem, the empirical studies on the flypaper effect phenomenon have mostly been evolved in the United States (Gramlich, 1977; Fisher, 1982). A review of empirical works is presented in Table 1 in a summarised form that elucidates the overwhelmingly occurrence of the flypaper effect, except a few cases. In Table 1, \( \frac{dE}{dG} \) and \( \frac{dE}{dl} \) denote that the slope or rate of change local expenditure relative to the slope or rate of change of untied grants and the slope or rate of change local expenditure relative to the slope or rate of change of voters’ income, respectively. If \( \frac{dE}{dG} \) is greater than \( \frac{dE}{dl} \) then the flypaper effect ensues.

<table>
<thead>
<tr>
<th>Author</th>
<th>Sample</th>
<th>( \frac{dE}{dG} )</th>
<th>( \frac{dE}{dl} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inman (1971)</td>
<td>Panel study of 41 city budgets</td>
<td>0.71, 0.56</td>
<td></td>
</tr>
<tr>
<td>Feldstein (1975)</td>
<td>State block grants to Massachusetts towns</td>
<td>0.21, 0.47</td>
<td></td>
</tr>
<tr>
<td>Weicher (1972)</td>
<td>State school grants to fiscally independent</td>
<td>0.58, 0.001</td>
<td></td>
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<tr>
<td></td>
<td>districts</td>
<td></td>
<td></td>
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<tr>
<td>Gramlich and Galper</td>
<td>Federal and state grants to 10 large urban</td>
<td>0.25, 0.05</td>
<td></td>
</tr>
<tr>
<td>Author</td>
<td>Year</td>
<td>Description</td>
<td>Study Period</td>
</tr>
<tr>
<td>-----------------</td>
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<td>-----------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Ehrenberg</td>
<td>1973</td>
<td>Panel data of per capita federal and state grants in 11 functional categories of employees during the period 1958-69</td>
<td></td>
</tr>
<tr>
<td>Ladd</td>
<td>1975</td>
<td>Cross section data of education expenditure in Boston SMSA</td>
<td></td>
</tr>
<tr>
<td>Inman</td>
<td>1979</td>
<td>A sample of 58 long Island school districts</td>
<td></td>
</tr>
<tr>
<td>Zampelli</td>
<td>1986</td>
<td>Federal and state aid to 18 large U.S. cities over the period 1974-78</td>
<td></td>
</tr>
<tr>
<td>Case et al.</td>
<td>1993</td>
<td>Federal grants to 48 states during 1970-85</td>
<td></td>
</tr>
<tr>
<td>Dollery and</td>
<td>1995</td>
<td>Federal grants to states in Australia during 1982-92</td>
<td></td>
</tr>
<tr>
<td>Worthington</td>
<td></td>
<td>Lump sum grants to 14 general category states for two separate time periods i.e. 1980-81 to 1989-90 and 1991-92 to 1997-98.</td>
<td></td>
</tr>
<tr>
<td>Lalvani</td>
<td>2002</td>
<td>Fiscal transfers to 375 municipalities in the Swiss canton of Vaud for the period 1994 to 2005.</td>
<td></td>
</tr>
<tr>
<td>Cappelletti and</td>
<td>2013</td>
<td></td>
<td></td>
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<tr>
<td>Soguel</td>
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</tbody>
</table>

The preponderance of evidence is that an amount increase in untied transfers stimulates much more local public spending than does the income going to the voters due to cutting taxes by central government. However, a few empirical evidences, for instance, Feldstein (1971), Ehrenberg (1973), Ladd (1975), Inman (1979), Zampelli (1986) as evident in Table 1 show that increase in income has greater stimulatory impact on local spending than does the similar amount increase in untied transfers. A good summary of estimated flypaper effect can be found in Fisher (1982). The author has shown what several researchers theoretically predicted followed by estimated the flypaper effect. In this regard, Bailey and Connolley (1998) have reviewed further research after Fisher in 1982 and concluded that no single explanation has been corroborated both theoretically and empirically. Furthermore, the authors had tried to provide some plausible explanations to the largely varying the value of dE/dG, shown in Table 1.
The occurrence of overestimated flypaper effect is due to the use of a linear functional form, rather than logarithmic\(^2\), which is inappropriate (Becker, 1996). According to her, the flypaper effect is “purely a statistical artefact”, hence, she concluded from her empirical observation that this effect is very sensitive in nature and incongruous model specification may mislead the results about the flypaper effect – whether it is present of not, or even if it is present, the magnitude is true in reality or not. Keeping the possibility of specification bias in mind, she had not only considered the variables that represented fiscal illusion for complexity of the bureaucracy and endogeneity of grants but she had also considered the functional form as logarithmic, not linear and she found no statistical evidence of the flypaper effect. Based on such issues, she argued that the expedient measure of the flypaper effect is the ratio of the estimated grant coefficient to the predicted grant coefficient. Worthington and Dollery (1999) applied Becker’s (1996) conclusion in the Australian context and found a similar result that no evidence of the flypaper effect. Before Becker (1996), Hamilton (1983) had mentioned that the socioeconomic status (quality of life) of the residents in a local jurisdiction is an important input in provisioning of local public services. Thus, the flypaper effect may artificially be created by excluding such sort of representative variable. Therefore, he used “income as an input” hypothesis in explaining the flypaper effect. This model signifies that the income elasticity of demand for public sector educational output may be larger than the observed income elasticity of demand for purchased inputs.

\(^2\) The authors who have used linear estimates are: Inman (1971), Weicher (1972), McGuire (1978) and Johnson (1979). On the other hand, the authors who have used logarithmic estimates are: Ehrenberg (1973), Feldstein (1975), Ladd (1975), Inman (1979) and Zampelli (1986).
However, Wyckoff (1991) included the socioeconomic variables mentioned by Hamilton (1983) and some other but his findings contradict what Hamilton had concluded. Based on his findings, he concluded that inclusion of some extra socioeconomic variables certainly helped to explain local government expenditure but could not help explaining the flypaper effect – the increase in local spending due to receiving an extra amount of untied grants.

Inman (2008) argued two further issues that form estimation bias, which are: one, data classification crafts an econometric problem. Matching grants have been misclassified as exogenous grants, not endogenous and if exogenous grant is correlated with omitted variables like citizens’ talent or willingness to volunteer, which are positively associated with their income, then that would lead to a downward bias for estimating the effect of income and an upward bias in estimating the effect of grants. The second point is: the flypaper effect is the bearer of the effect of political institutions’ involvement. In a decentralised service delivery framework, unless local politicians have proper understanding of local needs, the fiscal decentralisation may not be effective than it desired since this would create an incompatibility between bottom-up demand and top-down supply and management, as a result, the flypaper effect can be misleading. Thus, he concluded that the empirical results that he has not only provided but all the empirical results supporting the flypaper effect can be understood as an anomaly or a puzzle if we view governments as agents for a representative citizen voter.

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3 Hamilton (1983) argued to incorporate these two important variables in order to minimise the specification bias.
This however again validates the conclusion of Becker (1996) that this effect is purely a statistical object.

Motivated by the conclusions of Inman (2008), Vegh and Vuletin (2011) have recently contributed to the theoretical and empirical literature relating to the flypaper effect for Argentinean provinces and Brazilian states. The have explained the flypaper effect based on portfolio theory and insurance arguments in the context of these two countries. Two hypotheses they had tested, which are: one, the flypaper effect should be a decreasing function of the correlation between intergovernmental transfers and voters’ income and second, if the volatility in the correlation between the two increases then the flypaper effect will further keep on decreasing. After testing, they found that these two hypotheses for a sample of provinces / states of both the two countries. This has been a new approach followed by an intriguing finding that no empirical literature have had undertaken that higher the correlation between the explanatory variables (fiscal transfers and voters’ income) lower the flypaper effect.

Due to all the aforementioned complex issues, not a single justification for the flypaper effect exist that has been substantiated both theoretically and empirically. Since the majority of the empirical research has grown in the United States based, very little research can be found in Australia, Argentina, Brazil, Germany, Switzerland and some other countries across the globe. However, in Indian context, there are only three research articles analysing the flypaper effect, of which, two exercises are based on state-specific – Rajaraman and Vasishtha (2000) have examined on Kerala and Karnik and Lalvani (2005) on Maharashtra. The
remaining only research has been performed on 14 general category states by Lalvani (2002) for two time periods separately, i.e. 1980-81 to 1989-90 and 1991-92 to 1997-98. A large part of literature in Indian context on intergovernmental fiscal transfers has evolved on the issues and evidence relating to its design, methodological concerns and economic rationale.

Lalvani (2002) found that the flypaper effect is justified for 14 Indian general category states where lump sum grant\(^4\) stimulates local public spending of the states more vis-à-vis the increase in own tax revenue. Further, the author has made an attention-grabbing observation that whenever grant devolution has declined then the states have tried to offset their expenditure responsibilities by mobilising own revenue. This implies that the structure of intergovernmental transfers in India does not have an incentive effect as states followed by local governments do not put efforts to exploit their tax potential to the fullest. Only what this signifies is that the occurrence of flypaper effect in itself may not ensure the quality of local governments in the long run although it would certainly indicate the fiscal stance of the local governments and the intermediate tier for policy perspective and further probing. Karnik and Lalvali (2005) have found that the flypaper effect to be vindicated for urban local bodies in Maharashtra. The flypaper effect is confirmed even when there was a small or large decline in grants. However, Rajaraman and vasishtha (2000) had shown a different type of flypaper effect. The authors examined the impact of lump sum untied grants on tax effort (own tax revenue) of rural local governments (panchayats) of Kerala for the year

\(^4\) The author has defined the “lump sum grant” as the sum total of Finance Commission and Planning Commission transfers excluding discretionary grants from various central ministries and departments.
1993-94 covering 938 *gram panchayats*. The ‘tied’ grants in India sustain an accounting mechanism whereby the unspent balance has to be returned to the grantor. Given this, the authors examined the flypaper effect on a sense that ‘untied’ grants should raise their fiscal autonomy as well as raise own tax revenue of the *panchayats* when there is no balanced budget constraint on local bodies, and found that the impact is negative, i.e. no flypaper effect. They also concluded that the grants are poorly targeted to the rural ethnic fragmentation.

Given the India’s fiscal federal structure and from the literature review discussed above, it appears in Indian context that the institutional structure and disharmony of interests are the two major mechanisms in determining the occurrence of flypaper effect at the last tier of governments. The former is discussed in the subsequent paragraph. However, many researchers, who have provided some theoretical explanations regarding the disharmony of interest such as, Niskanen (1968), Wilde (1968), McGuire (1975), Gramlich (1977), Romer and Rosenthal (1980), Oates (1979) have argued that bureaucratic behaviour is the prime reason behind the flypaper effect assuming that they are only interested in shaping up their welfare, as a result, create substantial information asymmetry to the citizens.

However, owing to many reasons, intergovernmental fiscal transfers in India have not served its purpose as it should have been. In India, there are three institutions through which funds are being devolved. These are Finance Commission, Planning Commission and various other central ministries and departments. Finance Commission, which is a non-political body, provides formula
based statutory untied transfers (share in central taxes) while a major portion of tied grants through various centrally sponsored schemes (CSSs) lies outside its purview. All the CSSs are discretionary in nature and being provided by several central ministries and departments. Another institution, which is Planning Commission, was providing plan grants using Gadgil-Mukherjee formula. This was being determined by the consensus of National Development Council (NDC). This is a political body where all the states are its members. Such multiple institutions are providing different types of transfers (tied and untied; and formula based and discretionary) in an uncoordinated manner, consequently, it becomes increasingly difficult to pursue the economic aim of intergovernmental transfers (Rao and Singh, 1998). With many complexities in analysing the flypaper effect, the complexity in Indian intergovernmental transfer system, it becomes essential to look whether flypaper effect occurs across states in India while this area has not been adequately probed as of now.

5: Interpreting Data

For this study and based on unavailability of panchayat level fiscal data, we could examine the flypaper effect on 14 states over a decade period ranging from 2002-03 to 2012-13. Also, while the flypaper effect is precisely concerned about the untied transfers but it has been difficult to separate the untied portion from the total transfers as the reported transfers are aggregate in nature. Definitions of the variables that have been used in the study are reported in Table 2.

5 The names could be found in Table A.1.
Table 2: Variables Used in the Study

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>LE</td>
<td>Per capita total local government expenditure (PRIs)</td>
<td>Thirteenth and Fourteenth Finance Commission</td>
</tr>
<tr>
<td>L1.LE</td>
<td>One year lag value of LE</td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td>Per capita own revenue of PRIs</td>
<td></td>
</tr>
<tr>
<td>L1.OR</td>
<td>One year lag value of OR</td>
<td></td>
</tr>
<tr>
<td>IT</td>
<td>Per capita total intergovernmental transfers</td>
<td></td>
</tr>
<tr>
<td>L1.IT</td>
<td>One year lag value of IT</td>
<td></td>
</tr>
<tr>
<td>TXEF</td>
<td>This variable is tax effort, defined as per capita own tax revenue as a percentage of per capita GSDP.</td>
<td>Finance Accounts of the states (various years) and Central Statistical Office (CSO), Ministry of Statistics and Programme Implementation (MoSPI)</td>
</tr>
<tr>
<td>ARA</td>
<td>Percentage share of area of each state in all states combined</td>
<td>Registrar General of India</td>
</tr>
<tr>
<td>FRCV</td>
<td>This variable is forest cover - the total of moderate dense and very dense forest for each state as a percent to total of moderate dense and very dense forest for all states combined.</td>
<td>India State of Forest Report (various years) of Forest Survey of India, Ministry of Environment, Forest and Climate Change</td>
</tr>
<tr>
<td>HDI</td>
<td>Human Development Index value</td>
<td>National Human Development Report 2001 and India Human Development Report 2011</td>
</tr>
</tbody>
</table>

5.1: Descriptive Statistics

The Box-Whisker plot (or called as boxplot - Figure 2) and its table (Table A.1) exhibit the differing patterns of own revenue, total transfers and total expenditure in per capita terms of the Panchayati Raj Institutions (PRIs) for the 14 states. At the outset, it is clearly visible that both the mean and median of the total transfers are much larger vis-à-vis own revenue and total expenditure while both the values are abysmally low in case of own revenue. Even the interquartile range (IQR) of total transfers is considerably high as well. One highly concerning issue is that for all the three cases, the mean values are greater than the median values,
which implies the distribution of the data are skewed to the right (i.e., positively skewed\(^6\)) while the quartile based check shows that the distribution is negatively skewed, where the median values are closer to the lower quartiles. What this signifies is that in all the three cases, the data have serious distributional problems with substantial variances. Moreover, the value of relative mid-spread is comparatively better in total transfers whereas the coefficient of variation reveals that total expenditure is better as compared to own revenue and total transfers. This difference has been ensured predominantly due to the outlier (positive) in the total transfers, i.e., Karnataka. Essentially, mean based summaries have a problem of being unduly pulled up by the small or large part of data while order based summary statistics is safest as this is resistant summary measure – this resists by being unduly pulled up by the extreme lower or upper part of the data range (Mukherjee, White and Wuyts, 1998). As a consequent of these issues, the relationships amongst own revenue, total transfers and total transfers appear to be a week (Figure 4). The trend of all the three variables for all 14 states combined shows the similar picture. This has been shown in Figure 3. It is also notable from the figure that per capita total transfer has increased at a faster rate than per capita total expenditure. Thus, to control such dispersions within each variable, we have taken the logarithmic form of these three variables; consequently, no outlier has been found (see Figure A.1).

\(^6\) Positive skewness indicated more data are to the left side of the mean and vice-versa.
Figure 2: Box-Whisker Plot of Fiscal Incidence of the PRIs
Source: Author’s computations (Basic data: Thirteenth and Fourteenth Union Finance Commissions).
Note: The value of each variable obtained from the average of the period ranging from 2002-03 to 2012-13.

Figure 3: Trends in Fiscal Variables of the PRIs
Source and note: Same as Figure 1.
6: Econometric Model Specifications and Results

Before we move to the specification of our models, it is important to discuss some of the important peculiarities of dynamic panel model in order to construct the basis of our analysis, which have been presented in the below equations.

\[ y_{it} = \alpha + \beta y_{i,t-1} + \gamma x_{it} + u_{it} \]

\[ u_{it} = \eta_i + \omega_t + \nu_{it}, \quad i(1)N; \quad t(2)T \] \hspace{1cm} \text{(1)}

\[ \Delta y_{it} = \beta \Delta y_{i,t-1} + \gamma \Delta x_{it} + \Delta u_{it} \] \hspace{1cm} \text{(2)}

\[ E(y_{i,t-s} - \Delta u_{it}) = 0 \quad t = 3, \quad T \quad s \geq 2 \] \hspace{1cm} \text{(3)}
The equation 1 represents the general form of dynamic panel model, where error term has been decomposed into three terms - time specific, panel (state) specific and random disturbance term. The next step is to control the time series effect, where the generalised method of moments (GMM) starts with the first difference. This is presented in the equation 2. This step also removes the panel specific effects. The equation 3 shows the first-moment condition that does not include explanatory variables and might result in the inefficient outcome as it does not control for reverse causality. The equation 4 and equation 5 show the necessary and sufficient conditions for reverse causality, respectively.

As mentioned above, the equation 1 is a dynamic panel regression with a lagged dependent variable as a regressor. Following the fundamental literature by Holtz-Eakin et al. (1988), Arellano and Bond (1991), Ahn and Schmidt (1995 and 1997), Arellano and Bover (1995), and more recently, Blundell and Bond (1998); we can conclude that the underlying econometric hypothesis should address using a GMM approach. Unlike the static model, we do not need to look at the issues related to the choice of fixed or random effect. However, the unobserved panel level effects make standard estimators inconsistent since by construction, such effects are correlated with the lag value of the dependent variable. What really more crucial here is to ensure the serial correlation property of the disturbances.

$$E(\Delta x_{i,t-s} - \Delta u_i) = 0 \quad t = 3, \quad T \quad \forall s \quad \text{(4)}$$

$$E(\Delta x_{i,t-s} - \Delta u_i) = 0 \quad t = 3, \quad T \quad s \geq 0 \quad \text{(5)}$$
while formulating the estimation procedure. Thus, we adopt the GMM principle suggested by Arellano and Bond (1991).

Arellano and Bond (1991) proposed an efficient estimation procedure by taking first differences to get rid of the individual effects and then by incorporating all the past information of $y_{it}$ as instruments and this way it makes use of all available moment conditions. Hence, the authors have derived a steady generalised method of moments (GMM) estimator for the parameters that by default include one year time lag of the dependent variable as covariate and contain unobserved panel level effects – fixed or random. The GMM estimator has predominantly been designed for datasets with larger number of cross sections vis-à-vis the number of time periods. The estimator however requires checking and ensuring that there be no autocorrelation in the idiosyncratic errors. Note that this method allows us to take care for potential endogeneity of the explanatory variables and the issue of reverse causality. Following set of equations explain explicitly the moment condition of a dynamic panel model if treated according to GMM formulation of Arellano and Bond (1991).

The consistency of the GMM estimator cores on the legitimacy of the above defined moment conditions. Note that the moment conditions incorporate the hypotheses that residuals being serially uncorrelated and the erogeneity of the explanatory variables. Hence, it is essential to ensure these rules by conducting specification tests. The Sargan test checks the complete rationality of the moment

---

7 We can interpret how the 3rd order moment depends on 2nd order but it is not possible to interpret in the reverse way since there are moments of different orders. Arellano-Bond dynamic panel estimation does not provide the $R^2$ value since $R^2$ is 2nd order moment and cannot be interpreted in terms of higher order moments (3rd order, 4th order and so on).
conditions. The null hypothesis of no misspecification in the model is rejected when the minimised GMM criterion function displays a large value compared with a chi-squared distribution with the degree of freedom equal to the difference between the number of moment conditions and number of parameters.

While specifying the models, we used the logarithmic functional form over linear for two important reasons. These are: one, to control the flypaper effect from being overestimated (Becker, 1996) and two, an outlier, which was found in total transfers in the Figure 2 has not emerged after transforming the data in log form, presented in Figure A.1. The main three variables of our estimated Arellano-Bond dynamic panel data model are: total local government expenditure as the dependent variable and; total transfers and own revenue as explanatory variables. Apart from these, the variables incorporated in our model that has implications and economic rationale for decisions relating to intergovernmental fiscal transfers is:

(a) *Tax Effort*: Since the states’ fiscal autonomy if being carried by their respective local level governments, this variable has been bearing a significant role in determining intergovernmental transfers to the last tier. This variable is defined as per capita own tax revenue as a percentage of per capita GSDP. This signifies that greater tax effort brings better fiscal stance to the states; hence that state requires a comparatively smaller amount of fund devolution. In contrast, the central government might transfer larger grants as an incentive for augmenting service delivery.
(b) **Area:** The Tenth Finance Commission had brought the ‘area’ as a determinant of horizontal fiscal transfers, since then; this has followed in the subsequent finance commissions. The notion of bringing this factor in determining funds to be devolved was that the state with the larger area would incur larger administrative costs; thereby a positive association between them is anticipated.

(c) **Forest Cover:** Forest areas are not used for the economic activity. The geography itself is a major constraint. The Fourteenth Finance Commission has incorporated the forest area (moderately dense and very dense forest) within each state as a determinant of horizontal fiscal devolution. Thus, a positive relationship could be foreseen between forest cover and transfers.

(d) **Human Development Index:** State wise Human Development Index (HDI) is a broad and well-recognised indicator of development. Hence, larger share of funds should be devolved to the states that are lagging behind vis-à-vis other states in terms of overall development. Therefore, an inverse association is likely between the HDI and transfers.

To begin with, we have applied ordinary least squares (OLS) regression on the panel data that comprises fourteen cross section and eleven time periods where total local government expenditure is being explained by the total transfers to predict the fitted value of $y$-hat in this model. This is presented in the Figure 5, which reveals that dispersion persists in actual values of the states against the fitted value of $y$-hat (the bold red line), of which, in particular, Andhra Pradesh, Himachal Pradesh and Tripura exhibit high dispersion. However, Megdal (1987)
concluded through Monte Carlo evidence that OLS estimates of the flypaper effect lead to incorrect conclusions. Therefore, we have used Arellano-Bond dynamic panel data regression in controlling such transpiring dispersion.

Figure 5: Differing Pattern from Fitted Values to Predicted y-hat: Cross-section Dummies

The intergovernmental transfers and its impact on local spending in a decentralised setting are purely dynamic by nature. To present this dynamic behaviour in an analytical framework, we postulate equation 1. Equation one explains the relation between intergovernmental transfers and local spending along with other influencing factors in a dynamic panel formulation. As argued earlier, the intergovernmental transfer is a time distributed phenomenon thereby the present value of transfers is dependent upon its past realisation.
The Arellano-Bond dynamic panel functional form with one lagged dependent to be estimated for the flypaper effect in this study is presented by the equation 6 and 7 below:

\[
\ln LE_{it} = \beta_0 + \beta_1 \ln LE_{i,t-1} + \beta_2 \ln IT_{it} + \beta_3 \ln IT_{i,t-1} + \beta_4 \ln OR_{it} + \beta_5 \ln OR_{i,t-1} \\
+ \beta_6 TXEF_{it} + \beta_7 ARA_{it} + \beta_8 \ln FRCV_{it} + \beta_9 HDI_{it} + u_{it} \quad (6)
\]

\[
u_{it} = \eta_i + \omega_t + \epsilon_{it} \quad i(1)N; \quad t(2)T \quad (7)
\]

where, subscript \( i \) stands for the fourteen Indian states and \( t \) for the time-period (Eleven-year time series ranging from 2002-03 to 2012-13).

We have performed several forms of Arellano-Bond dynamic panel models based on the scenario observed consistent with our hypothesis and the results of GMM estimation reported in the Table 3 to exhibit how the flypaper effect takes place and captures its plausible magnitude of the relationship between intergovernmental transfers and local spending decisions. The estimates of the models I to IV show the instantaneous effect of the regressors on the regressand while the Model V to VII reveals the lag effect, particularly of two explanatory variables viz., own revenue and total transfers. All the explanatory variables except the one year lag of total transfers and own revenue have emerged as robust determinants of transfers at different levels of significance across all the models. In both the categories, i.e., instantaneous effect and lag effect, the coefficients of own revenue have appeared negative, even appeared significant in the model II and III, which signifies that for each one point increase in own revenue, the total local government expenditure decreases by that coefficient value points. Since Hamilton (1983) and Becker (1996) raised a point regarding the inclusion of suitable
indicators on socioeconomic status. Hence, we have incorporated the human development index value of the states to capture effort of local bodies to become self-sustained entities. However, the coefficients of this variable in the Model IV and VII have emerged insignificant.

The results in all the models overwhelmingly support the occurrence of the flypaper effect across the fourteen states in India. The coefficient values in all the seven models explicate that the total intergovernmental transfers have significant impact on stimulating total local spending while the own revenue in all the models explicates its negative impact in augmenting the local expenditure. The highest coefficient value of transfers (i.e. 0.456) has been found in the model VII, which incorporates all the theoretically recognised determinants to measure flypaper impact on local spending behaviour. It is also important to note that the lag of the dependent variable in all the models bears a significant positive impact on its subsequent year's value. However, the impact of lag values of both total transfers and own revenue have emerged insignificant. The coefficients of the lags of transfers have even appeared negative whereas the coefficients of the lags of own revenue have turned into positive while these were negative in all the pre-lag scenarios. Thus, it makes confounded to conclude what role the abysmally low own revenue plays in stimulating local public spending across states. This is further compounded by the fact of emerging significant impact of the tax effort by the states, which could be seen in the Model IV and VII. This has ensued mainly due to the inclusion of the
HDI value as a regressor, although, the correlation matrix (Table A.2) shows no such significant correlation amongst these two variables.

Table 3: Impact of Intergovernmental Transfers on Local Spending Decisions
Dependent variable: ln (total local government expenditure)

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Instantaneous</th>
<th>Lag effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model I</td>
<td>Model II</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>l1.le</td>
<td>0.315**</td>
<td>0.279**</td>
</tr>
<tr>
<td></td>
<td>(3.18)</td>
<td>(2.84)</td>
</tr>
<tr>
<td>it</td>
<td>0.226**</td>
<td>0.420**</td>
</tr>
<tr>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>(4.09)</td>
<td>(4.43)</td>
</tr>
<tr>
<td>l1.it</td>
<td>-0.134</td>
<td>-0.148</td>
</tr>
<tr>
<td></td>
<td>(-1.23)</td>
<td>(-1.36)</td>
</tr>
<tr>
<td>or</td>
<td>-0.264*</td>
<td>-0.303**</td>
</tr>
<tr>
<td></td>
<td>(-2.49)</td>
<td>(-2.78)</td>
</tr>
<tr>
<td>l1.or</td>
<td>0.045</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>(0.34)</td>
<td>(0.03)</td>
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<td>txef</td>
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<tr>
<td></td>
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<td>(2.24)</td>
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</tr>
<tr>
<td></td>
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<td>(1.42)</td>
</tr>
<tr>
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<tr>
<td></td>
<td>(-1.33)</td>
<td>(-0.76)</td>
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<tr>
<td>_cons</td>
<td>2.745**</td>
<td>2.575**</td>
</tr>
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<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>(4.65)</td>
<td>(4.42)</td>
</tr>
</tbody>
</table>

| No. of Observations  | 126           | 126         | 126         | 126         | 126         | 126         | 126         |
| Wald Chi2             | 41.13         | 48.94       | 37406.5     | 34592.6     | 47.52       | 35988.5     | 32864.0     |
| Sargan test (chi2)    | 78.31#        | 75.25#      | 72.78#      |

Notes: 1) Figures in parentheses are t-statistics
2) “\(\ln\)” denotes the log transformation

2) * \(p<0.05\), ** \(p<0.01\), *** \(p<0.001\)

3) # signifies that over-identifying restrictions are not valid.

There are two major evident points in Table 3, which are: one, the constant term in the Model I, II and V have appeared significant and two, the same has been dropped in the remaining four models. The significant appearance of the constant term indicates that some substantial information are missing in the model(s) as explanatory variable(s). The variables namely, tax effort, area, forest cover and human development index have been incorporated based on reviewing empirical literature and mainly due to the integration of these by the Union Finance Commissions for computing horizontal devolution formula for distributing share in central taxes to the states. However, this needs to be probed further aimed at integrating some more relevant indicators, which would be able to assess on local spending decisions in more profound way, i.e., through statistical significance and in turn, would help the model specification towards further appropriation. The second point, which was on the occurrence of dropped constant terms in the Model III, IV, VI and VII, could be comprehended by the inclusion of the ‘area’ component. The geographical area of states in a nation hardly varies unless a few larger states have been bifurcated or owing to some other reasons. The area appears as a ‘time-invariant’ variable for the studied fourteen states. One peculiar property of such variables for the case of GMM estimation is that it replaces the constant term of model by itself. As a consequence of this, the Sargan test statistic, which is one of the post estimation tests of over identifying restrictions gets dropped as well. This statistic appeared in the remaining three models signifying that over-identifying
restrictions are not valid. Although, the Sargan test gained less importance in case of panel data estimation since ‘time varying’ explanatory variables in different time periods are potential instruments, which implies over-identifying restrictions has automatically been built in panel data models (Sargan, 1958). But in our model, the area as ‘time invariant’ variable that has made the Sargan test infeasible.

7: Conclusion

Based on two key conclusions, the flypaper effect has gained importance in fiscal federalism literature over last three decades, although in Indian context very limited literature has explored this effect. These are: one, the flypaper effect is understood as only an empirical phenomenon (Becker, 1996) and second, no single justification of its existence is found that is verified both theoretically and empirically (Bailey and Connolly, 1998). Debates on econometric model specifications with suitable variables and preference on logarithmic functional form over linear to control being overestimated the flypaper effect has occupied a considerable segment of literature. Due to several complexities not only in its estimation part but inadequate theoretical explanations of bureaucratic behaviour and different decentralisation practices across countries based on their priorities have made analysing the flypaper effect multifaceted than one commonly perceives.

We have used the Arellano-Bond dynamic panel estimation to show whether the flypaper effect occurs across states in India. Since all the fiscal
variables of the local governments (own revenue, total transfers and total expenditure) reveal substantial variations, we thus have transformed the data into a logarithmic form. The other explanatory variables we have chosen from the Union Finance Commissions, which they have used as determinants of fund devolution, of which, the ‘area’ has appeared as ‘time-invariant’. Thus this variable has made the constant term dropped from four models, which has in turn, made the policy recommendations confounded. It could be understood that this is certainly a strong determinant of grants, and the Finance Commissions have taken one-year data of area with some other determinants to arrive at the share of horizontal devolution to the states. However, the abysmally low fiscal autonomy ratio of the states and their local level governments has made them highly reliant on intergovernmental fiscal transfers and our results overwhelmingly support the occurrence of the flypaper effect – the transfers have significantly greater stimulatory impact on the local spending decisions than the own revenue.

Based on one of the important conclusions by Lalvani (2002) saying that when transfers from top tier fall, the states were able to manage to maintain their revenue expenditure, which signified that the states’ revenue potential than the actual is high, but the transfers have made them less active in mobilising their own tax and non-tax revenue, thereby the structure of intergovernmental transfers system should be restructured. This has not been validated by our data while the per capita total transfers has not declined in any particular year during this eleven year period, rather shown a gradual increase, although, revenue and capital wise disaggregated expenditure data is unavailable for last five year period. This issue
needs to be probed further since happening the flypaper effect in itself may not
ensure the improved governance under a decentralised setting, but for which, we
need a public standing database on local public finance, which is also a serious
concern for India and needs to be addressed with an immediate effect.
References


## Annexures

Table A.1: Descriptive Statistics of the Box-Whisker Plot of Fiscal Incidence of the PRIs (Per capita in Rupees)

<table>
<thead>
<tr>
<th>State</th>
<th>Own Revenue</th>
<th>Total Transfers</th>
<th>Total Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>126.24</td>
<td>1251.84</td>
<td>997.55</td>
</tr>
<tr>
<td>Goa</td>
<td>170.06</td>
<td>375.70</td>
<td>342.14</td>
</tr>
<tr>
<td>Gujarat</td>
<td>61.67</td>
<td>2494.33</td>
<td>1082.04</td>
</tr>
<tr>
<td>Karnataka</td>
<td>124.99</td>
<td>3022.55</td>
<td>1099.89</td>
</tr>
<tr>
<td>Kerala</td>
<td>147.29</td>
<td>1318.63</td>
<td>581.73</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>119.18</td>
<td>2700.01</td>
<td>1112.33</td>
</tr>
<tr>
<td>Orissa</td>
<td>7.00</td>
<td>677.82</td>
<td>604.18</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>6.81</td>
<td>619.68</td>
<td>447.30</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>132.41</td>
<td>1034.32</td>
<td>623.84</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>6.34</td>
<td>264.54</td>
<td>235.88</td>
</tr>
<tr>
<td>West Bengal</td>
<td>21.89</td>
<td>571.49</td>
<td>304.90</td>
</tr>
<tr>
<td>Assam</td>
<td>10.34</td>
<td>858.37</td>
<td>655.93</td>
</tr>
<tr>
<td>Himachal Pradesh</td>
<td>28.32</td>
<td>796.64</td>
<td>191.38</td>
</tr>
<tr>
<td>Tripura</td>
<td>6.55</td>
<td>1571.61</td>
<td>869.60</td>
</tr>
</tbody>
</table>

### Descriptive Statistics

<table>
<thead>
<tr>
<th>Summary Statistics</th>
<th>Description</th>
<th>Own Revenue</th>
<th>Total Transfers</th>
<th>Total Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>The average value of the range of the data</td>
<td>69.22</td>
<td>1254.11</td>
<td>653.48</td>
</tr>
<tr>
<td>Standard Deviation (S.D.)</td>
<td>Average squared distance from mean</td>
<td>63.37</td>
<td>886.95</td>
<td>330.03</td>
</tr>
<tr>
<td>Coefficient of Variation</td>
<td>S.D. / Mean</td>
<td>0.915</td>
<td>0.707</td>
<td>0.505</td>
</tr>
<tr>
<td>Minimum</td>
<td>The minimum value of the range of the data</td>
<td>6.34</td>
<td>264.54</td>
<td>191.38</td>
</tr>
<tr>
<td>Lower Quartile</td>
<td>The middle value between the range of minimum and median</td>
<td>7.83</td>
<td>634.22</td>
<td>368.43</td>
</tr>
<tr>
<td>Median</td>
<td>The middle value of the range of the data</td>
<td>44.99</td>
<td>946.35</td>
<td>614.01</td>
</tr>
<tr>
<td>Upper Quartile</td>
<td>The middle value between the range of median and</td>
<td>125.93</td>
<td>1508.36</td>
<td>965.57</td>
</tr>
</tbody>
</table>
The maximum value of the range of the data is 1112.33.

<table>
<thead>
<tr>
<th>Maximum</th>
<th>Inter Quartile Range (IQR) / Mid-spread (MS)</th>
<th>Relative Mid-spread</th>
<th>Step</th>
<th>Lower Fence</th>
<th>Upper Fence</th>
<th>Positive Outliers</th>
<th>Negative Outliers</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Maximum value of the range of the data</td>
<td>Inter Quartile – Lower Quartile</td>
<td>Relative Mid-spread</td>
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<td>Upper Quartile + Step</td>
<td>Values &gt; Upper Fence</td>
<td>Values &lt; Lower Fence</td>
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<td></td>
<td>170.06</td>
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<td>-169.31</td>
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<td>×</td>
<td>×</td>
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<tr>
<td></td>
<td>3022.55</td>
<td>874.15</td>
<td>0.92</td>
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<td>2819.59</td>
<td>Karnataka</td>
<td>×</td>
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<tr>
<td></td>
<td>1112.33</td>
<td>597.14</td>
<td>0.97</td>
<td>-527.28</td>
<td>1861.27</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>

Source and Note: Same as Figure 2.

Figure A.1: Box-Whisker Plot of Fiscal Incidence of the PRIs (Logarithmic)
Source and Note: Same as Figure 2.
Table A.2: Correlation Matrix

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<th></th>
<th>le</th>
<th>or</th>
<th>it</th>
<th>txef</th>
<th>hdi</th>
<th>ara</th>
<th>frcv</th>
</tr>
</thead>
<tbody>
<tr>
<td>le</td>
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<tr>
<td>or</td>
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<td>(0.000)</td>
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<td>(0.000)</td>
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<td></td>
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<td>0.358*</td>
<td>0.168*</td>
<td>0.311*</td>
<td>0.334*</td>
<td>-0.204*</td>
<td>0.427*</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.037)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.011)</td>
<td>(0.000)</td>
<td></td>
</tr>
</tbody>
</table>

Note: 1) Figure in the parentheses are p-values.
2) * indicates significant at 1 percent level of significance.
Source: Author’s computation based on the source mentioned in Figure 2.