

Fly-paper effect of fiscal transfers in India: A dynamic panel analysis

Prasant Kumar Panda

*Department of Economics, Central University of Tamil Nadu,
Thiruvarur-610101, Tamil Nadu, INDIA*

prasantkumar@cutn.ac.in

ABSTRACT

The paper empirically examines the expenditure impact and fly-paper effect of lump-sum fiscal transfers in India, considering a panel data set for 22 states for the period of 1980-81 to 2010-11. A set of double-log dynamic panel equations have been specified and System GMM estimation technique is adopted to obtain the coefficients. It is observed that the states' per capita aggregate expenditure and revenue expenditure are highly stimulated by the widespread availability of lump sum transfers. The fly-paper effect hypothesis is vindicated in Indian context. It is found that expenditure response to lump-sum transfers is higher than the same of the equivalent increase in voter incomes or State GSDP. However, the magnitude of difference in coefficients that is the existence and size of fly-paper effect is subject to appropriate specification of model and variables for analysis. The vindication of fly paper effect has serious implications for the efficacy of fiscal system and perverse incentives of lump sum transfers which need to be addressed.

Keywords: Federal transfers, Lump-sum transfers, States' spending,
Allocative effect, Fly Paper effect, Panel data models

JEL Classification: H77, H72, C23

1. Introduction

In analyzing budgetary impacts of federal grants several studies highlighted on the issue of fly-paper effect. Fly-paper effect refers to the empirically observed phenomenon of a general lump sum grant (an unconditional grant) to a community exhibiting a far greater stimulatory effect on local government spending than an equivalent increase in individual income. In other words, the expenditure response to an increase in an unconditional grant is significantly greater than that resulting from an equal increase in private income, which is known as fly-paper effect.

The federal transfers mediated to States can be classified into two important forms: (i) conditional transfers (also referred as specific purpose transfers or matching grants) and (ii) unconditional transfers (also referred as lump-sum transfers or block transfers or general purpose transfers). In the literature, it is argued that unconditional transfers are required to achieve fiscal equalization while matching transfers will help to internalize spill-over of public services and efficient provision of those. The fly-paper effect is related with the impact on expenditure of lump-sum transfers from Central to States. It provides implication for disincentive effect of transfers. The general lump-sum transfer has a far greater stimulatory effect on State and local government spending than the equivalent increase in State GSDP. The State governments in order to maximize their political goals¹ do not exploit revenue to its full potential from the change in revenue base, i.e., States GSDP and hence, the response of expenditure to GSDP is lower. But, the expenditure response to increase in lump-sum transfers would be higher. From this discussion the hypotheses that emerged is as follows:

H1: The expenditure impact of lump-sum Central transfers to States is higher than that from equivalent increase in States' income (GSDP).

In this perspective, the main objective of the study is to examine the expenditure impact and fly-paper effect of the lump-sum transfers. The rest of the study is structured as follows: Section-2 reviews relevant literature. Section-3 provides an outline about the data and variables used in the model. The model specification and estimation techniques are analyzed in section-4. Section-5 provides the empirical results and necessary discussions on results. Concluding remarks are presented in section-6.

2. Review of literature

Studies like Gramlich and Galper (1973); Inman (1979); Islam and Choudhury (1989) and Stine (1994) analysed the fiscal behaviour response of State and local governments to federal grants. It was observed that the federal grants stimulated local spending and the expenditure elasticity coefficient responding to central transfers was often found to be greater than unity. Further, the expenditure response to increase in lump-sum resources transfers was higher than that of to increase in voter income in the States, which validated fly-paper effect. But, the existence or size of the fly-paper effect has been questioned on the grounds of flaws in terms of statistical or specification errors that existed in the afore-mentioned studies and led to an overestimation of such effect. Mis-specification of the type of grant (King 1984 and Megdal 1987) or grant variable (Moffitt 1984 and Zampelli 1986) or use of an inappropriate functional form- mostly linear (Becker 1996) or use of inappropriate variables or omission of appropriate variables (Hamilton 1983) in an analysis of expenditure impact of lump sum grants may over-estimate the coefficient and vindicate the fly-paper effect. Wyckoff (1991) contradicted Hamilton (1983) by including more socioeconomic variables in his study and using log-linear model as suggested by Moffitt (1984) and Megdal (1987). He observed that

¹ The literature provides different theoretical explanation for fly-paper effect. For details see Bailey and Connolly (1998, p. 342).

while the extra socio-economic variables helped to explain expenditure levels, they did not help to explain the fly-paper effect. Further, he concluded that the fly-paper effect was unlikely to fade away with the inclusion of these omitted variables.

The literature² also provides theoretical explanations or justification for fly-paper effect. Some of the possible explanations that have been advocated in the literature, for the expenditure response to unconditional grants being higher than that of increase in voters' income, include: (i) minimizing dead weight loss of welfare created by local government taxation; (ii) consideration of transaction cost; (iii) a low income constraint; (iv) failure by institutional structure; (v) disharmony of interests between voters and politicians or bureaucrats; (vi) bureaucratic behaviour of maximizing own welfare; (vii) greedy politicians' behaviour (viii) fiscal illusion; (ix) uncertainty and risk aversion and (x) pressure groups .

In Indian context few studies examined the fly-paper effect of federal fiscal transfers. Lalvani (2002) empirically tested the fly-paper effect of lump sum grants in Indian States considering a data set of 14 major States for two different periods i.e., 1980-81 to 1989-90 and 1990-91 to 1997-98. Two stage least square technique was employed for estimation of coefficients. To obtain the coefficients, she regressed the total expenditures of the States on lump sum grants, a dummy variable to check asymmetry hypothesis and a set of control variables like net State domestic product, population and own revenue of the States. It was observed that, the lump sum grant variable had significant and positive effect. Its coefficient was higher than the coefficient of State domestic product. This validated fly-paper effect and suggested that grants stimulated expenditures to a greater extent than income. Further, the results also vindicated asymmetry effect of a cut in grants than a rise of the same. Though, the study was an initial attempt to address fly-paper effect in Indian context, the coefficients may be biased and unduly high due to the use of data at levels instead of being normalized to per capita terms, besides the selection of linear functional form.

Karnik and Lalvani (2005) empirically examined the fiscal response of urban local governments to State government grants in the context of fly-paper effect and asymmetry hypothesis, for Maharashtra State in India. The data set covered 243 municipal councils and municipal corporations in 29 districts of Maharashtra over a period of six years from 1993-94 to 1998-99. They aggregated the fiscal variables of all the urban local bodies within a particular district, to treat it as a unit. The estimates were obtained using cross-sectional heteroskedastic and time-wise autoregressive model. Their results vindicated fly-paper effect of grants from State governments to urban local bodies, but evidence regarding asymmetric response to a reduction in grants was ambiguous. Although, the study exclusively examined the fiscal response of local governments to State government grants, it offered analytical insights into the analysis of effect of grants. Due to the use of asymmetry dummy they did not consider log linear specification. In case of log-linear specification, it could have provided different coefficients, which needs to be re-examined.

Panda and Nirmala (2013) empirically verified the incentive effects of federal transfers on states' spending considering a panel data set for 22 Indian states for the period 1980-81 to 2004-05. They employed fixed and random effect models to estimate the coefficients. They observed that central transfers not only have stimulatory effect on states' spending but also they have disincentives on expenditure economy of states. Further their results validate fly-paper effect in Indian context. But they considered a static framework for their analysis without considering the grant variable as endogenous.

² Bailey and Connolly (1998) provided the review of these literatures that would justify the fly-paper effect from different perspective and gave a useful discussion on them.

From the above analysis, it is observed that most of the empirical studies confirm fly-paper effect although the expenditure elasticity (partial) coefficients vary in size. Nevertheless, the debate on the existence, size and justification of fly-paper effect still continues. Dollery and Worthington (1996) presented a summary of the important studies of the fly-paper effect during the 1980s and 1990s. Similarly, Bailey and Connolly (1998) provided a comprehensive review of literature pertaining to various aspects of existence, validity and justification of fly-paper effect, besides identifying more productive avenues for future research.

3. Data and Variables

An annual dataset for analysis is obtained from various secondary data sources for 22 Indian States, for which data are adequately available for the period of 1980-81 to 2010-11. These States constitute around 93.28 percent of country's population and 92.19 percent of Indian GDP in 2010-11. The figures for three States³ namely Bihar, Madhya Pradesh and Uttar Pradesh are considered for undivided States in order to maintain uniformity in data.

State expenditure (aggregate), revenue expenditure and capital disbursements of State in per capita terms are alternatively used as dependent variables to analyse the impacts of transfers on State spending and fly-paper effect. The explanatory variables used in different regression models are same and they include mainly certain economic and demographic factors like Per capita GSDP, density of population and Lump-sum per capita transfer. The dependent variables are expressed in terms of per capita Indian rupees and adjusted with the base year price of 1999-2000.

Gross State domestic product (GSDP) data at current prices and constant prices in the 1980-81 series, 1993-94 series, 1999-2000 series and 2004-05 series are obtained from the Central Statistical Organization (CSO). The 1980-81 series, 1993-94 series and 2004-05 series data are converted into 1999-2000 series by splicing the indices to make them comparable with the CSO in the 1999-2000 series data. Comparable GSDP (in per-capita terms) at constant price (1999-2000 prices) has been used in the study. Density of population measures the number of population living per square kilometer of area. Data pertaining to population, density of population are obtained from Census of India⁴

(Registrar General of India). Mid-year figures for these variables are obtained by interpolation.

Central transfers to states in India are usually classified as follows:

- (i) Statutory transfers, which are the share in Central taxes + statutory grants;
- (ii) Grants for State plan schemes ;
- (iii) Discretionary grants , which are grants for Central sector + grants for Centrally sponsored schemes; and
- (iv) Aggregate revenue transfers from the Centre, which are i + ii + iii + other non-plan grants excluding statutory grants.

³ In 1998 these three States are divided and another three States namely Jharkhand, Chhattisgarh and Uttaranchal are created.

⁴ The data provided by Census of India are decadal in nature. Data pertaining to total population, urban population and density of population are of this type. Following the standard practices in the literature the mid-year figures of the missing data points of decadal measures are obtained by interpolating decadal figures with the help of the compound growth rate formula. However, interpolated mid-year population figures are also given by CSO.

Besides, loans mediated to States from the Centre are not taken into account, as they are not strictly transfers. Lum-sum transfers⁵ are obtained by deducting transfers for specific schemes like grants for Central sector and centrally sponsored schemes from aggregate revenue transfers from Centre. Per capita lump-sum transfers are obtained by normalising lump-sum transfers by population.

The data for various types of transfers, and State expenditure, revenue expenditure and capital disbursements are obtained from different issues of the *RBI Bulletin*, and *State Finances - A Study of Budgets*. Price deflator is recovered from the ratio of current to constant price GSDP figures. The price deflator and mid-year population figure are used to convert the fiscal data to constant price terms (with 1999-2000 prices as base) and to per capita terms respectively, wherever necessary. All the fiscal variables used in regression, are expressed in terms of per-capita Indian rupees, adjusted with the base year price of 1999-2000.

The variables used in the study with their abbreviation and the summary statistics are reported in table 1. The standard procedure of reporting over all mean values, standard deviation along with minimum and maximum values for each variable is adopted.

Table 1 : Summary statistics

Variable	Abbreviation	Obs.	Mean	S.D.	Min.	Max.
Per-capita Aggregate Expenditure of the States	PCAEX	682	2968.67	2961.17	718.56	24602.01
Per-capita Revenue Expenditure	PCREX	682	2352.13	2568.32	443.58	22848.18
Per-capita Capital Disbursement	PCCAD	682	787.48	635.05	84.66	4943.95
Per-capita Gross State Domestic Product	PGSDP	682	14015.14	39453.02	2942.47	70219.14
Density of Population	POPDN	682	390.24	366.51	43.95	1089.19
Per-capita Lump-sum Transfers	PCLST	682	1279.27	1529.39	97.53	15487.21

Source : Calculated by the author using Stata 10.1 (Basic data from various issues of *RBI Bulletins*; *State Finance- A Study of Budgets*, RBI; Census; and CSO reports).

4. Model Specification and Estimation Techniques

Econometric models like dynamic panel data models are used to analyze the fly-paper effect of federal transfers. The Panel models or the covariance models are found to perform better than conventional models based on a single dimension (either time-series or cross-section) data. In these models the main advantage is pooling cross-section and time series data which permits a substantial increase in degrees of freedom and hence increases the reliability of the estimates. Further, the quality of parameter estimates might be better, as the pooled sample permits the incorporation of unobserved State or time specific effects in the model.

⁵ A detailed break-up of transfer data into lump-sum and specific purpose transfers for each State is not readily available at the RBI data sources. However attempt is made to derive lump-sum transfers by deducting transfers for Central sector and Centrally sponsored schemes from aggregate revenue transfers from Centre. It is quite possible that some component of transfers given by FCs and PCs are matching type, but as those break-up are not readily available, hence such grants are not excluded from aggregate transfers. Similarly, all the grants given under Central sector and Centrally sponsored scheme may not be matching in nature.

Before proceeding to specification of model and selection of estimation methodology to analyze the objectives, Levin, Lin and Chu (LLC) test (see Levin et al. 2002) , as well as, Im, Pesaran and Shin (IPS, see Im et al. 1997) panel unit root test have been employed to verify stationary properties of the included variables. The results of panel unit root tests (see table - 2) indicate that the variables selected are either stationary or trend stationary. Most of the variables are found to be stationary when trend is included along with fixed effect. Thus, it needs the inclusion of a time trend as another explanatory variable in the model.

Table 2 : Unit Root Test Results

Variable	Effect	Test	Statistic	P-value	Effect	Test	Statistic	P-value
POPDN	ft	LLC	-0.733	0.231	f	LLC	-1.2309	0.1002
		IPS	-1.881	0.029**	f	IPS	-2.751	0.0.003*
PCAEX	ft	LLC	-4.268	0.000*	f	LLC	-5.623	0.000*
		IPS	-9.122	0.000*	f	IPS	-9.744	0.000*
PCREX	ft	LLC	-3.983	0.000*	f	LLC	-7.0143	0.000*
		IPS	-6.818	0.000*	f	IPS	-10.657	0.000*
PCCAD	ft	LLC	-1.341	0.090***	f	LLC	0.025	0.5106
		IPS	-2.456	0.007*	f	IPS	-0.1678	0.431
PCLST	ft	LLC	-6.714	0.000*	f	LLC	-4.320	0.000*
		IPS	-8.2408	0.000*	f	IPS	-8.190	0.000*

Notes : *, ** and ***denote significance at 1%, 5% and 10% level respectively; f denotes fixed and individual effects; t denotes time trend; LLC indicates Levin, Lin and Chu test ,and IPS indicates Im, Pesaran and chin Test.

Correlation matrix is computed to analyze the correlation among the explanatory variables. Correlation matrix of the explanatory variables used in various models in the study is presented in table-3. All the coefficients of explanatory variables are within limits.

Table 3 : Correlation matrix of explanatory variables

Variable	PGSDP	POPDN	PCLST
PGSDP	1.0000		
POPDN	0.0812	1.0000	
PCLST	0.0732	0.4302	1.0000

Table- 4 presents the results of autocorrelation test of dependent variables at their level, used in different models to analyse the impacts of transfers on States' expenditure. Results indicate that the dependent variables are highly auto-correlated and persistent. The first order autocorrelation coefficient for all dependent variables, like PCAEX, PEREX, and PCCAD varies between 0.75 to 0.91, indicating that the current year values of these variables are dependent on their past values.

Table 4 : Autocorrelation in dependent variables

	AC	Q-Stat	Prob.
PCAEX(level)	0.910	458.21	0.000
PCREX(level)	0.912	460.14	0.000
PCCAD(level)	0.750	311.32	0.000

Further, current values of expenditures may depend on past values or structural uncertainties. Even when coefficients of lagged dependent variables are not of direct interest, allowing for dynamics in the underlying process may be crucial for recovering consistent estimate of the parameters (Bond 2002). With these considerations in mind, the following dynamic panel

models have been specified to empirically examine the impacts of Central transfers on spending and fly-paper effect.

In order to verify the fly-paper effect hypothesis, all categories of expenditure in per capita terms are alternatively regressed on the set of control variables and per capita lump-sum transfers (PCLST) from the Centre. The literature suggests that use of inappropriate functional form mainly linear, and studies that do not take endogeneity of grant variable can result in fly-paper effect being inflated to a large extent. Considering this, the variable PCLST is considered as endogenous and a logarithmic dynamic functional form is specified for estimation.

The specific model is:

$$\text{LnPCEXP}_{hit} = \beta_0 + \beta_1 \text{LnPCEXP}_{hit-1} + \beta_2 \text{LnPGSDP}_{it} + \beta_3 \text{LnPOP}_{it} + \beta_4 \text{LnPCLST}_{it} + \beta_5 \text{TREND}_t + u_i + \varepsilon_{it}$$

where,

PCEXP_h = per capita State expenditure of type h; and $h = 1, \dots, 3$;

PCEXP_1 = per capita aggregate expenditure of the States (PCAEX);

PCEXP_2 = per capita revenue expenditure of the State (PCREX);

PCEXP_3 = per capita capital disbursement (PCCAD);

PGSDP = per capita GSDP;

POP_{DN} = density of population;

PCLST = per capita lump-sum transfers;

$i = 1, \dots, 22$; $t = \text{time } (1, 2, 3, \dots, 31)$; $t = \text{current year}$; $i = \text{State}$;

ε = random error terms; u = panel specific effect; β_0 = intercept coefficient; TREND_t = linear time trend; and β_1, \dots, β_8 = coefficients of explanatory variables

The table 5 displays the hypothesized relations and signs of the variables of interest with the various components of tax effort and spending measures as dependent variables. This is derived in tune with the testable hypotheses specified in section-1.

Table 5 : Expected Signs

Dependent Variable	Lag-dependent	PGSDP	POP _{DN}	PCLST
PCAEX/ PCREX/ PCCAD	+	+	+	+

The explanatory variables discussed above have both temporal and spatial variation. But, the time invariant State specific effect are controlled by panel level effect u_i in terms of State specific dummies. Trend specific factors are controlled by linear time trend. The unexplained

variations in the regression are captured by the error term ε_{it} , which is assumed to be normally distributed, homoskedastic and independent across observations.

In the models outlined above, both Ordinary Least Square (OLS) estimator and within estimator are inconsistent because of correlation between panel level effect and lagged dependent variable, which is used as regressor. So, the option lies in looking for instrumental variables and Generalized Method of Moments (GMM) estimators. In literature, various GMM estimators are widely used for estimating parameters in case of dynamic panels. Arrelano-Bond (1991) Difference GMM estimator exploits instruments from lagged values of endogenous and exogenous variables by forming moment conditions. But, as the autoregressive parameters are too large, Arrelano-Bond estimator will also not yield efficient estimators. Hence, System GMM (Arellano-Bover 1995/Blundell- Bond 1998) estimator has been used.

More specifically, System GMM estimator has been employed, in the present study, to estimate the coefficients. Robust standard errors for correcting heteroskedasticity and two step estimators are used where ever necessary. Further, necessary post estimation tests have been employed for verifying the validity of the model or the instruments selected for the model. While Arellano-Bond (1991) test is used to assess the presence of auto-correlation at the first differenced error, Sargan (1958) test is employed to verify the validity of over identifying conditions in the model.

5. Empirical Results

In this sub-section regression results in the context of fly-paper effect of transfers on States' spending is analysed. Per capita aggregate expenditure (PCAEX), Per capita Revenue expenditure (PCREX) and per capita capital disbursements (PCCAD) of the States are alternatively regressed on per capita lump-sum transfers (PCLST) from Centre after controlling for PGSDP and POPDN in log-linear specification to analyse the fly-paper effect of transfers. In the dynamic specification, the variable of interest PCLST is treated as endogenous⁶.

The results of fly-paper effect analysis are shown in table 6. The variable of interest PCLST is found to be positive and significant for all categories of expenditure, but the magnitude of the coefficient is seen to be higher than that of income (PGSDP) for PCAEX and PCREX. So, in Indian context fly-paper effect hypothesis is valid for revenue expenditure and aggregate expenditure of States. In other words, if there is an increase in lump-sum transfer, it stimulates State expenditure: both revenue and total expenditure to a greater extent than an equivalent increase in State GSDP. But the capital disbursement per capita has responded positively to change in Lump-sum transfers, but the coefficient is not higher than that of income per capita. This also supports that Central transfers have more stimulative effect on State expenditure, particularly revenue expenditure. An earlier study by Lalvani (2002) also confirmed the validation of fly-paper effect hypothesis in Indian context.

⁶ The detail advantages of log-linear specification and considering the transfer variable as endogenous are discussed in section-3.

Table 6 : Fly-paper effect : GMM Estimation Results

Dependent Variable-	(1) LnPCAEX	(2) LnPCREX	(3) LnPCCAD@
Lag Dependent	0.47882* (14.02)	0.57344* (21.09)	0.37786* (11.50)
LnPGSDP	0.3117* (19.68)	0.4108* (13.27)	0.2135** (2.03)
LnPOPDN	0.72667* (21.18)	-0.033 (-1.36)	0.18133 (0.66)
LnPCLST	1.31201* (23.06)	0.63* (16.15)	0.1424* (3.55)
Wald Test P-value	4487.25* 0.0000	727.07* 0.0000	424.29* 0.0000
Sargan Test P-Value	- -	- -	21.42 1.0000
AB Test m1 P-Value	-1.5357 0.1219	-1.4301 0.1456	-3.39 0.007
AB Test m2 P-Value	-1.1152 0.1243	-0.41387 0.6763	1.69 0.10

Notes : t-values are given in parentheses; *, ** and ***denote significance at 1%, 5% and 10% level respectively; and @ indicates two step system GMM estimates.

Source: Calculated by author, using Stata 10.1(Basic data from various issues of *RBI Bulletins; State Finance- A Study of Budgets*, RBI; Census; and CSO reports).

The literature suggests that the coefficients of lump-sum transfer will be inflated if the transfer variable is not considered endogenous and appropriate specification is not taken into account. So just for comparison, this fly-paper effect analysis is re-examined in a static framework and without taking the transfer variable as endogenous. The results are reported in table - 7. It is observed that the magnitude of difference in coefficients (between transfer and income variable) decreases from static to dynamic model, because in the latter model the PCLST has been considered as endogenous.

Table 7 : Fly-paper effect: Panel Regression results in static model

Dependent Variable	LnPCAEX	LnPCREX	LnPCCAD
Explanatory Variables	Fixed-Effect Model	Fixed-Effect Model	Fixed-Effect Model
LnPGSDP	0.4289* (3.029)	0.2923* (2.9861)	0.1887* (3.8597)
LnPOPDN	0.2059* (7.0591)	0.40510* (11.0613)	-0.3543 (- 1.118)
LnPCLST	1.7414* (2.9503)	0.7455* (3.2453)	0.5309* (4.063)
Constant	-0.744* (-12.214)	-2.687* (-10.22)	2.996* (20.438)
Hausman test (p-value)	12.74 0.0052	26.10 0.000	11.67 0.0086
Wald chi2	-	-	-
R ² overall	0.7341	0.6362	0.6495
F test	694.65*	862.60*	52.66*

Notes : t-values are given in parentheses; and * denotes Significant at 1% level of significance.

Source : Calculated by author, using Stata 10.1(Basic data from various issues of *RBI Bulletins; State Finance- A Study of Budgets*, RBI; Census; and CSO reports).

6. Conclusion

The paper examines the expenditure impact and fly-paper effect of federal fiscal lump-sum transfers in India. It is observed that the states' per capita aggregate expenditure and revenue expenditure are highly stimulated by the widespread availability of lump sum transfers. Further, the general finding that emerged from this analysis is that the fly-paper effect hypothesis is vindicated in Indian context. It is found that expenditure response of lump-sum transfers is higher than the same of the equivalent increase in voter incomes or State GSDP. However, the magnitude of difference in coefficients that is the existence and size of fly-paper effect is subject to appropriate specification of model and variables for analysis.

The vindication of fly paper effect has serious implications for perverse incentives of lump sum transfers which need to be examined. Further there is a need to relook at the design of central transfers and particularly the ratio of lump sum transfers to total transfers.

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