COP28 and Environmental Federalism: Empirical Evidence from an Emerging Economy, India

No. 406
06-February-2024
Lekha Chakraborty, Amandeep Kaur, Ranjan Kumar Mohanty, Divy Rangan and Sanjana Das

National Institute of Public Finance and Policy
New Delhi

COP28 and Environmental Federalism: Empirical Evidence from an Emerging Economy, India

Lekha Chakraborty[1], Amandeep Kaur, Ranjan Kumar Mohanty
Divy Rangan and Sanjana Das

Abstract

Against the backdrop of COP28, this paper investigates the impact of intergovernmental fiscal transfers (IGFT) on climate change commitments in India. Within the analytical framework of environmental federalism, we tested the evidence for Environmental Kuznets Curve (EKC) using a panel model covering 27 Indian States from 2003 to 2020. The results suggest a positive and significant relationship between IGFT and the net forest cover (NFC) across Indian States. The analysis also suggests an inverse-U relationship between Gross State Domestic Product (GSDP) and the environmental quality, indicating a potential Environmental Kuznets Curve (EKC) for India. The findings substantiate the fiscal policy impacts for climate change commitments within the fiscal federal frameworks of India, and the significance of IGFT in increasing the forest cover in India. This has policy implications for the sixteenth Finance Commission of India in integrating a climate change related criterion in the tax transfer formula in a sustainable manner.

Keywords: Environmental Federalism, Environmental Kuznets Curve, Intergovernmental Fiscal Transfers, Government Expenditures

JEL Codes: E6, H5, H7

[1] This is an updated version of the paper presented at the International Institute of Public Finance meetings at Linz, Austria. The authors are grateful for the valuable comments and suggestions of the participants at the IIPF meetings. This paper is a previous version of the chapter submitted to OUP.

1. Introduction

Fiscal policy stance is a key policy instrument to ensure sustainable development, which rests on the fact that the functioning of the market cannot, by itself, activate the signalling, response and mobility of economic agents to achieve efficiency in both static (allocative efficiency) and dynamic (shift in the production frontier) terms. The role of fiscal policy stance in sustainable development proceeds from market failures of one kind or another. The emerging literature on *environmental federalism* deals with the fiscally decentralized determination of environmental quality and the dangers of 'race to bottom'. The 'race to bottom' happens due to inter jurisdictional competitiveness to attract the mobile capital (mobile firms) by excessively lax environmental standards. Against the backdrop of COP28 UAE, this paper aims to examine the link between fiscally decentralized public policy stance and environmental quality.

Existing theoretical and empirical literature on environmental federalism is heavily skewed towards the discussion on environmental regulations and ignores the fiscal policy content in it to a great extent. This is a nascent attempt to empirically capture the impact of fiscal policy in a federal economy on the environmental quality using Kuznets' U specification. This paper does not refute the widely explored Kuznets U phenomenon between economic growth and environmental quality, rather to emphasize that it does substantially through conscious public policies at the sub national levels of government, incorporating fiscal policy variables. The crucial question thus is whether fiscal policy stance has an impact on environmental quality.

The paper is divided into four sections. Apart from the introduction, section 2 deals with the theoretical framework of environmental federalism, while section 3 discusses empirical issues related to fiscal policy stance and environmental quality. The data and methodology is discussed in Section 4. Section 5 interprets the data and section 6 deals with the specification of the model and econometric estimation. Section 7 draws conclusions.

2. The Analytical Framework

In a fiscal federal setup, Oates (2001) envisions *three standard-setting functions* of environmental quality within the intergovernmental hierarchy. The first case considers environmental quality as a *pure public good* for the nation as a whole; the second prototypical case considers environmental quality as a *pure local public good*

and the third case, which deals with the effects of inter jurisdictional externalities and Coasian-type negotiations. Oates (2001) narrated the three functions as follows.

(1). Environmental Quality is a Pure Public Good: Centrally determined standard-setting function

This benchmark case considers that the vector of environmental quality (Q_i) is a function of aggregate level of emissions from all sources in the nation (E).

$$Q_i = f\{E\} \quad (1)$$

Global warming and depletion of ozone layer falls under this category. For these matters, environmental quality is an international *public good*.

(ii) Environmental Quality is a Pure Local Public Good: Decentralized Determination of standard-setting function

This prototypical case considers the level of environmental quality in the i^{th} jurisdiction as a function of level of activities in that jurisdiction alone.

$$Q_i = f\{e_i\} \quad (2)$$

The 'principle of subsidiarity' is directly applicable to this case; envisioning a decentralized determination of environmental quality. Each jurisdiction is expected to set its own appropriate standard for environmental quality, for instance, the protected area or net forest cover.

However, the empirical evidence suggests that in decentralized determination of environmental quality, there are dangers of 'race to bottom', which can emerge due to inter jurisdictional competitiveness to attract mobile capital by excessively lax environmental standards. This can result in sub optimal outputs of local public goods, including environmental quality.

(iii) Environmental Quality as a function of inter jurisdictional Spill Over Effects

This most recurring case considers environmental quality as a function of activities that flow across boundaries from other jurisdictions.

$$Q_I = f\{e_i, e_2, \ldots\ldots\ldots e_n\} \quad (2)$$

For instance, both air and water pollution flow across jurisdictions. In this case, one solution is to invoke central intervention, though the centrally determined uniform ambient national standards for environmental quality is not an optimal solution.

A Coasian sort of resolution of jurisdictional spill over affects through regional co-operations. But such co-operations are not easy to come as the cases of spill over effects across jurisdictions spurt a complex set of policy alternatives. It is also to be noted that there exists a dichotomy in the nature of inter jurisdictional externalities, whether emission of pollution flows is unidirectional or bidirectional.

3. Empirical Literature

There has been a continuous debate on the relationship between economic growth and environmental quality. In the initial phases of the debate, the idea was that economic growth is followed by increased economic activity and hence results in degradation of the environment (Ardndt, 1998; Meadows et al., 1972). But proponents of industrial growth were of the view that only by increasing economic activity, the problem of environmental degradation can be dealt with. Hence, the synthesis argument came with the introduction of the concept Environmental Kuznets Curve in the early 1990s termed similar to the one by Kuznets (1955) that claimed an inverse relationship between economic development and income inequality. By definition, Environment Kuznets curve depicts a hypothesised non-linear relationship between income (proxied for economic activity) and environmental degradation. The curve is inverted U-shaped implying that as economy grows, the environmental degradation increases and when the economy reaches certain level of income per capita, the degradation starts to decline and the trend reverses (Stern, 2004). When the countries are beginning to industrialise, pollution increases because people are more concerned for jobs and income than clean water and air which reverses when the people are able to afford abatement and value the environment (Dasgupta et al., 2002). The concept came through the study by Grossman and Krueger (1991) study on the impact of NAFTA and was subsequently introduced in the report on World Development (1992).

Sooner, with the availability of data for a larger number of countries, it was empirically tested by Shafik and Bandyopadhyay 1992, Stern et al. (1996) and many other consequently. Over the period, voluminous work has been published that empirically examines the EKC curve (pollution-income-growth relationship). Shafik, 1994 in her paper, mentions four possible indicators of environmental quality for any given country. These are endowment (climate and location -specific characteristics), Income (per capita income), Technology (proxied by time-trend) and policy (regulatory framework for emissions, energy taxation, investments, trade regimes). But she essentially examines the pollution-growth-income relationship through various indicators based on endowment. Stern (2004) in his review on EKC explains

that much of the studies tried to test the theory for local and global pollutants where local pollutants displayed the inverted U relationship (Shafik,1994; Lopez, 1994; Stern et al., 1996, Seldon and Song,1994). While for the global pollutants, environmental impact increases with income or has a high turning point with large standard errors (Cole et al., 1997. Moving further, once the economy crosses the desired level of income per capita, with increased resources, the country then tries to invest in abatement technology reconfirming the EKC curve implying 'grow first and then clean up'. At higher levels of development comes structural changes in the information-intensive industrial-services, environmental awareness, increased environmental expenditures etc (Dinda, 2004). Since regulation plays an imperative role in reducing emissions, many countries have liberalised economies by lowering subsidies, reducing barriers to trade and investments, privatisation of firms and breaking off the price controls. It is therefore critical to know the relationship between environmental policy regimes and economic development. Dinda (2004) emphasises in his paper that the availability of public goods is a state concern because people can't afford abatement technology. This implies environmental policy is subject to societal preferences and hence, demands for environmental protection comes from the local level but get framed at the national level as it generally happens. However, empirical studies have mostly used absolute measures of pollutants to derive this relationship. Additionally, there is some literature that examines the relationship between environmental quality, human development and economic health. Air pollution considerably leads to health deterioration (Zhao et al., 2016) and reduces human capital (Schmidt, 2019) and affects quality of life (Porreca, 2020). The paper by Porreca (2020) claims that a positive relationship exists between carbon emissions and the quality of life in the developing countries but disappears once the country has achieved a certain level of economic development.

Similarly, only handful of research exists on how the government expenditures impact the level of environmental quality (Lopez et al., 2011; Halkos and Paizanos, 2013; Galinato and Islam, 2017). In the paper by Halkos and Paizanos (2013), government expenditures can have both a direct and indirect impact on the level of pollutants in the economy. The paper examines 77 countries for the period 1970-2008 to analyse the relationship between government size and income on pollution, suggesting the long-term impact of government expenditures on the level of pollutants. The indirect impact of government spending through income implies that reduced government size reduces environmental quality. While for the countries with higher income levels, increases in the government size tend to reduce environmental quality because such countries are at the decreasing curve of the EKC and already have an established regulatory framework in place. This means that any further

increase in the government size will decrease the marginal utility and witness diminishing returns.

Another study by Galinato and Islam, 2017, reveals that a higher government expenditure on public goods raises income and so there is increased consumption and higher pollution levels as well. However, this is counteracted by strict regulatory measures and hence the pollution levels are in check. This is true for democratic nations where higher regulatory measures reduce the levels of pollution considerably.

Adding another perspective to the government spending, non-market-based environmental policy instruments have shown statistically insignificant results in the study by Badunenko et al. (2021) while the market-based policy instruments have a greater impact. As the environmental policy indicators rise by 1 percent, emissions growth falls by 20 percent. This reaffirms the idea that government spending plays an essential role in improving the environmental quality of the country.

Quoting Dasgupta et al. (2002), a correlation between a productive public policy and economic development appears to be, but there is considerable variation in the relationship in the way it is studied. In this paper, we shall seek to examine the impact of government spending on the environment in the context of India and check whether fiscal spending affects the environmental quality or not. Primarily, we shall also examine the role of transfers in improving the forest cover (proxied for environmental quality).

4. The Data and Methodology

We use panel regression (fixed/random effect) models for the empirical analysis. The variable of our interest is Gross state domestic product and its square term (Table 1). The study has also included other control variables including population and fiscal transfers (Table 2).

Table 1: Description of the Variables

Variables	Description	Source
VDFC	Very dense forest cover	India State of Forest Reports
POPL	Population	Report of the Technical Group on Population Projection by the National Commission on Population)
TRNS	Total transfers (Grants+ share in Taxes)	States Budget Documents
GSDP	Gross State Domestic Product	EPWRPF
	Source: Authors compilation	

Table 2: Descriptive Statistics of the Selected Variables

Stat/Variables	VDFC	POPL	TRNS	GSDP	GSDPSQ
Mean	2662.86	4.30e+07	2137247	3.46e+07	3.29e+15
Maximum	21095	2.28e+08	2.25e+07	2.82e+08	7.94e+16
Minimum	2	559000	18814.22	194552	3.79e+10
Std. Dev.	4028.027	4.62e+07	2823369	4.58e+07	8.75e+15
Observations	486	486	486	486	486

Source: Authors Estimation.

We used the following regression models as follows.

$$F_{it} = \beta_i + \beta_1 G_{it} + \beta_2 T_{it} + \beta_3 P_{it} + \lambda_i + \varepsilon_{it} \quad (1)$$

Where,

'i' represents States and "t" refers to the time period. F_{it} represents very dense forest cover (VDFC), G_{it} relates to Gross State Domestic Product and T_{it} refers to fiscal transfers and P_{it} refers to population. β_i represents intercept or constant. λ_i shows the effects of excluded variables in the model which are invariant overtime. ε_{it} is an error term, often called the idiosyncratic error or time-varying error because it represents unobserved factors that change over time and affect F_{it}.

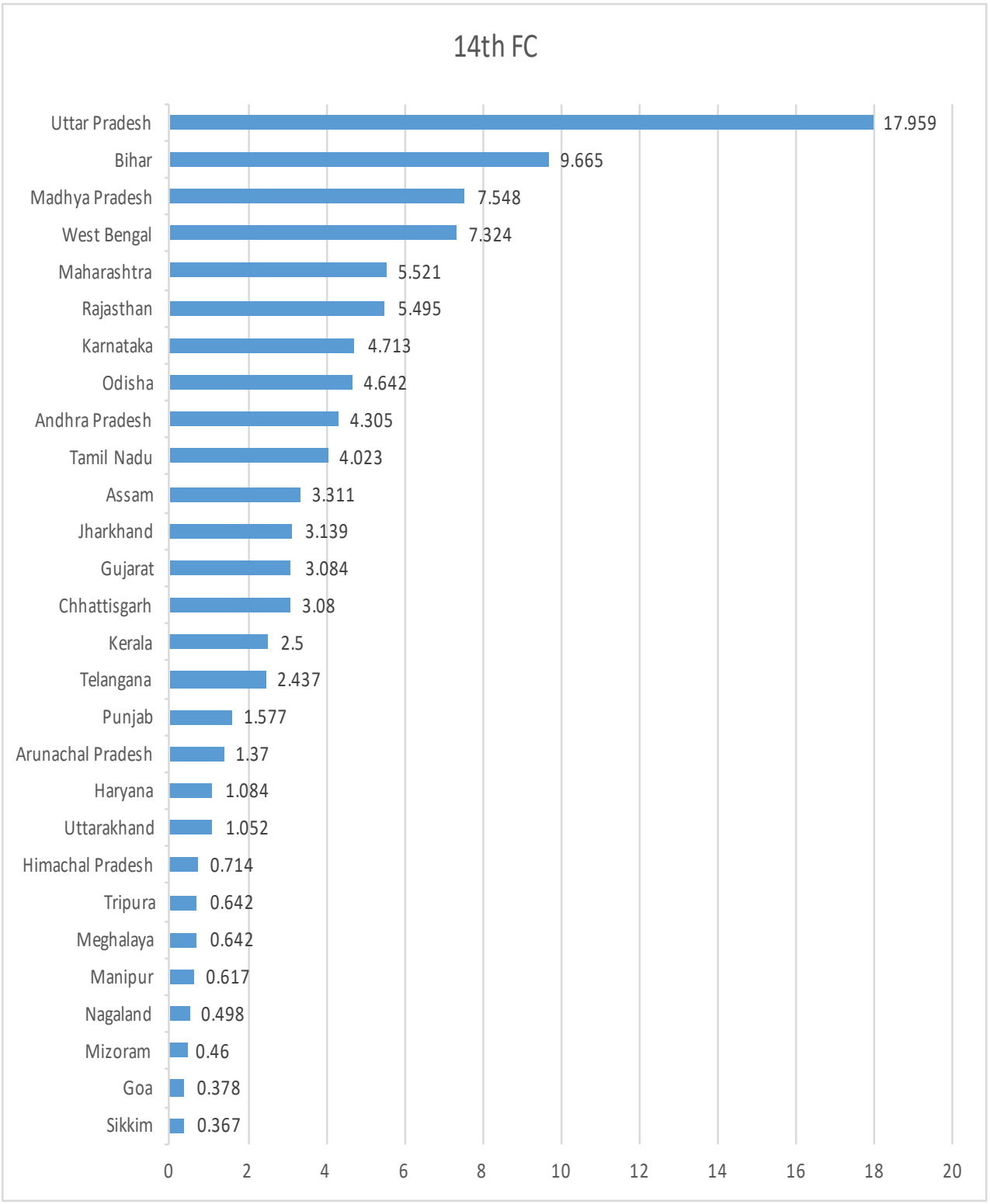
5. Interpreting Data

Figures 2 to 4 present the ecological fiscal transfers' share in the 14FC and 15FC to the states in India. The share of devolution is highest for the state of Uttar Pradesh, while the lowest share of devolution is taken by Sikkim in Figure 2 as per the 14th FC recommendations. Since the ecology-based criterion was retained by the 15th FC as well, the share of devolution to the states is presented in Figure 3 as an interim devolution. Figure 4 represents the final devolution made to the states as per the 14FC recommendations revealed in the 15th FC report presented in 2021. These estimates are the final devolution of the states where the lowest share went to Goa and the second lowest to Sikkim.

The point to be noted here is that the consistency of finance commissions in integrating climate change variables in tax devolution has led to an increase in forest cover in India. The bi-variate scatter plots revealed that the link between ecological fiscal transfer share and the very dense forest cover is positive[2].

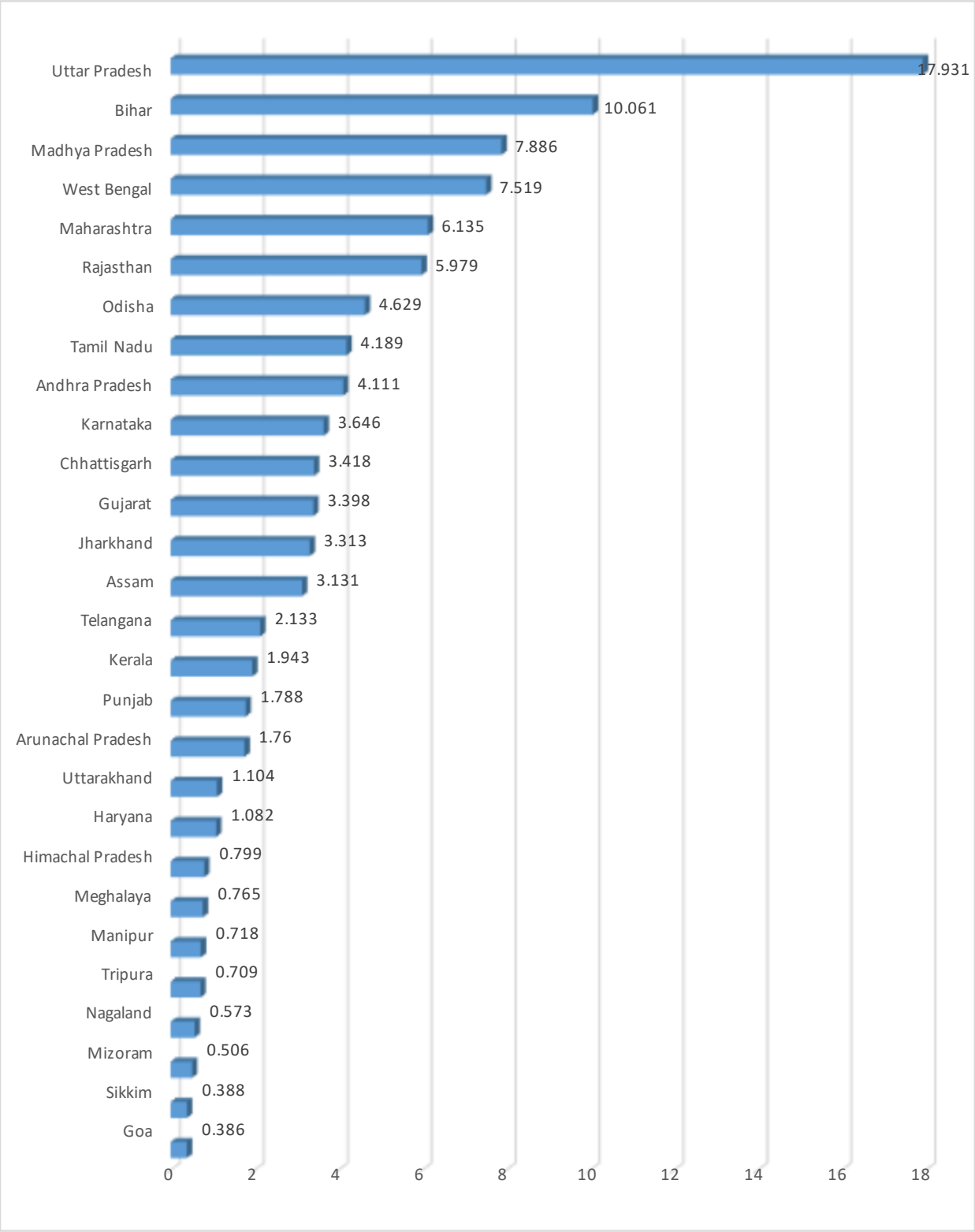
[2] The details of the scatterplot can be made available upon request from the authors.

Figure 2: Ecological Fiscal Transfer Share in 14th Finance Commission (in per cent)



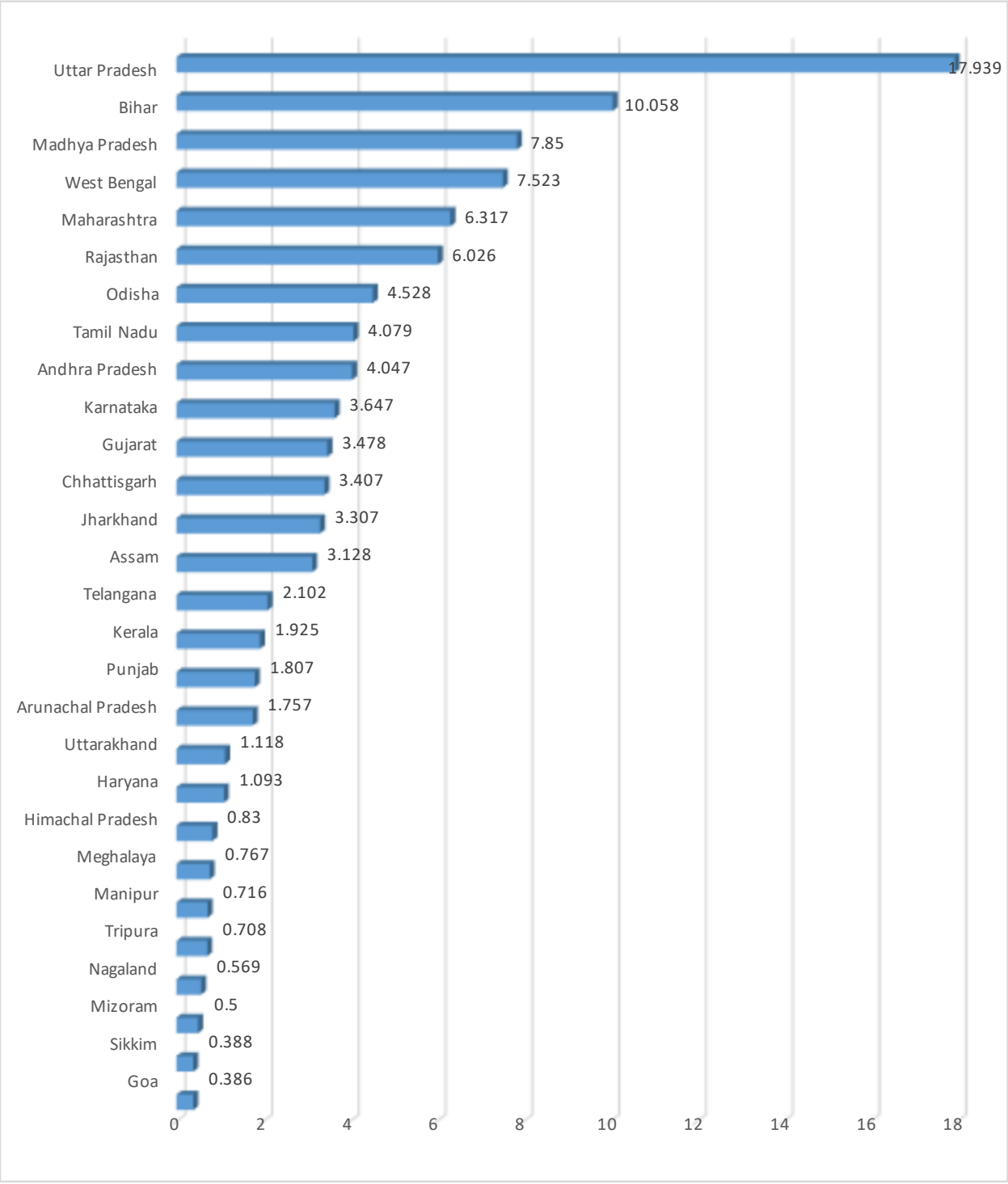
Source: Finance Commission report, 14th (2014).

Figure 3: Ecological Fiscal Transfer Share in 15th Finance Commission Interim Devolution (in per cent)



Source: Finance Commission Report, 15th (Interim) (2020).

Figure 4: Ecological Fiscal Transfer Share in 14th Finance Commission (in per cent)



Source: Finance Commission report, 15th (Final) (2021).

The rationale of fifteenth Finance Commission (both in interim and final reports) to retain the forest and ecology criterion with higher weight of 10 per cent was based on their "impact on the revenue disabilities and expenditure needs of States, and also on the huge ecological benefits to the nation and for meeting our international commitments". However, the climate change related variables are not just the forest sectoral variables. The future finance commissions may consider other crucial ecological variables, based on a composite ecological fiscal transfer index.

Three questions are crucial here. What is the effect of ecological fiscal transfers on State level spending on ecology? Are there any flypaper effects – evidence of the impact of intergovernmental transfers on local spending than own income? Jonah Busch *et al* (2020) found that introduction of EFTs has not yet led states to increase their forestry budgets. Kaur, et al (2021) however found evidence for the impact of intergovernmental fiscal transfers on ecological budgets more than the own income. The existence of flypaper effects in the context of ecological fiscal space is thus reiterated. Having established the evidence for effectiveness of ecological fiscal transfers on State level spending decisions on ecology (Kaur et al, 2021), it is inevitable to examine the degree in which the fiscal transfer is translated into better forest cover outcome.

6. Econometric Models and Results

In order to test the relationship between intergovernmental fiscal transfers (IGFT) and the net forest cover, we used the panel dataset for 27 states in India for the period 2003-2020. The states not under the analysis include Telangana and the State of Jammu & Kashmir. The reasons to dropping Telangana is that the state became an independent state in 2014. It was formerly a part of Andhra Pradesh. With the resolution passed to repeal section 370 of the Indian Constitution in August 2019, came the reconstitution of Jammu and Kashmir and Ladakh as two separate Union territory. Such reorganization implies reorganization in the resource devolution framework. Hence, to maintain consistency with the data, these two states were dropped.

In the analysis, the net forest cover is the dependent variable. The independent variables include the GSDP, GSDPsquared, Population, and Intergovernmental Fiscal Total Transfers (IGFT). The econometric results are presented in Table 3 below. In the models, we try to examine the relationship between forest cover and total IGFT, controlling for GSDP and population. Primarily, the purpose is to examine whether there is positive relationship between the forest cover and total fiscal transfers to the

state by the union government. Furthermore, we need to test the existence of EKC for India. The results revealed that there is a significant positive relationship between IGFT and net forest cover. Taking population as an independent variable, we see there is an inverse and significant relationship between population and net forest cover.

Table 3: Econometric Results

Variables	Model (1)	Model (2)
	NFC	NFC
GSDP	.0000164*** (4.52e-06)	.0000164*** (4.52e-06)
GSDP_SQ	-5.64e-14*** (1.57e-14)	-5.71e-14*** (1.57e-14)
Total Transfers	.000115*** (.0000391)	.0000862*** (.0000354)
POP	-.0000154* (8.83e-06)	
Cons	2694.587*** (805.5464)	2097.434*** (772.7207)
No. of Obs.	486	486
No. of Groups	27	27

Source*:* Authors' estimations.

Notes: ***, ** and * denote the significance level at 1 percent , 5 percent and 10 percent respectively. Figures in the bracket denote Standard errors

7. Conclusions

The study explores the fiscal policy imperatives for integrating ecological criteria in the intergovernmental fiscal transfers in India. Translating three setting functions of climate change commitments - as an international public good along with the plausibility of inter jurisdictional spill overs and the localized public good characteristics - into three components of tax transfer formula encounters measurement issues as well as methodological challenges to construct a composite ecological intergovernmental fiscal transfers (IGFT) index. Given that the global public good characteristics is outside the purview of intergovernmental fiscal transfers, a simple indicator capturing the local ecological public good can be a criterion of tax transfers. From that perspective, fourteenth finance commission of India has designed the world's first ever largest ecological fiscal transfers and the fifteenth finance commission has retained the ecological criterion. To keep the ecological criteria simple and practical, the finance commissions have used a single

indicator approach and used only net forest cover as the criteria for tax transfers, along with the other non-ecological variables, including population, area and income distance. The empirical evidence suggests that the consistency of ecological criterion in intergovernmental fiscal transfers in India has helped to increase the net forest cover. The econometric results revealed a positive and significant relationship between IGFT and net forest cover. This has policy implications for the Sixteenth Finance Commission of India.

References

Ardndt, Heinz W. (1998). "Market failure and Underdevelopment", World Development, 16(2).

Badunenko, O., Galeotti, M., and Hunt, L. C. (2021). Better to grow o better to improve? Measuring environmental efficiency in OECD countries with a stochastic environmental kuznets frontier.

Cole, M. A., Rayner, A. J., and Bates, J. M. (1997). The environmental Kuznets curve: An empirical analysis. *Environment and Development Economics*, *2*(4), 401-416.

Dasgupta, S., Laplante, B., Wang, H., and Wheeler, D. (2002). Confronting the environmental Kuznets curve. *Journal Of Economic Perspectives*, 16(1), 147-168.

Dinda, S. (2004). Environmental Kuznets curve hypothesis: a survey. *Ecological Economics*, 49(4), 431-455.

Finance Commission, 2019. *Fifteenth Finance Commission Interim Report*, New Delhi

Finance Commission, 2020. *Fifteenth Finance Commission Final Report*, New Delhi

Finance Commission, 2013. *Fourteenth Finance Commission Report*, New Delhi

Galinato, G. I.,and Islam, A. (2017). The challenge of addressing consumption pollutants with fiscal policy. *Environment and Development Economics*, *22*(5), 624-647.

Grossman, G. M., and Krueger, A. B. (1991). Environmental impacts of a North American free trade agreement.

Halkos, G. E., and Paizanos, E. A. (2013). The effect of government expenditure on the environment: An empirical investigation. *Ecological Economics*, *91*, 48-56.

Jonah Busch et al (2020). Did India's ecological fiscal transfers incentivize state governments to increase their forestry budgets?, *Environmental Research Communications* , 2(3).

Kaur, A., Mohanty, R. K., Chakraborty, L., and Rangan, D. (2021). Ecological fiscal transfers and state-level budgetary spending in india: Analyzing the flypaper effects. *Levy Economics Institute*, Working Papers Series July.

Kuznets, S. (1955). American Economic Association. *The American Economic Review*, 45(1), 1-28.

Lopez, R. (1994). The environment as a factor of production: The effects of economic growth and trade liberalization. *Journal of Environmental Economics and Management*, 27, 163–184.

López, R., Galinato, G. I., and Islam, A. (2011). Fiscal spending and the environment: theory and empirics. *Journal of Environmental Economics and Management*, *62*(2), 180-198.

Meadows, D.H., Meadows, D.L., Randers, J. and Behrens, W.W., (1972). The Limits to growth. Universe Books, New York.

Oates, Wallace, (2001). A Reconsideration of Environmental Federalism. *Discussion Paper*s(dp-01-54), Resources For the Future.

Porreca, Z. (2020). Environmental sustainability and human capital development. *Consilience*, (22), 48-57.

Schmidt, S. (2019). Brain Fog: Does Air Pollution Make Us Less Productive?. *Environmental Health Perspectives*, 127(5), 052001.

Selden, T. M., and Song, D. (1994). Environmental quality and development: Is there a Kuznets curve for air pollution?. *Journal of Environmental Economics and Management*, 27, 147–162.

Shafik, N. (1994). Economic development and environmental quality: An econometric analysis*. Oxford Economic Papers*, 46, 757–773.

Shafik, N., and Bandyopadhyay, S. (1992). Economic growth and environmental quality: time series and crosscountry evidence. *Background Paper for the World Development Report 1992*, The World Bank, Washington, DC.

Stern, D. I. (2004). The rise and fall of the environmental Kuznets curve. *World Development*, 32(8), 1419-1439.

Stern, D. I., Common, M. S., and Barbier, E. B. (1996). Economic growth and environmental degradation: The environmental Kuznets curve and sustainable development. *World Development*, 24, 1151–1160.

Zhao, X., Yu, X., Wang, Y.,and Fan, C. (2016). Economic evaluation of health losses from air pollution in Beijing, China. *Environmental Science and Pollution Research*, 23(12), 11716–11728.

MORE IN THE SERIES

- Bhattacharya, Rudrani, (2024). How did Transition to the GST Regime Affect Inflation in India? WP No. 405 (February).
- Chakraborty, Lekha, (2023). Beyond GDP and Public Policies for Gender Equality: Gender Budgeting in Asia Pacific, W.P. No. 404 (September)
- Mukherjee, Sacchidananda (2023). Distributional Imapct of Indian GST, W.P. No. 403 (October).

Lekha Chakraborty, is Professor, NIPFP
Email: lekha.chakraborty@nipfp.org.in

Amandeep Kaur, is Economist, NIPFP
Email: amandeep.kaur@nipfp.org.in

Ranjan Kumar Mohanty, is former Assistant Professor, NIPFP
Email: ranjanmohanty85@gmail.com

Divy Rangan, is former Research Fellow, NIPFP
Email: divyrangan@gmail.com

Sanjana Das, is Independent Scholar
Email: sanjanadas900@gmail.com

National Institute of Public Finance and Policy,
18/2, Satsang Vihar Marg,
Special Institutional Area (Near JNU),
New Delhi 110067
Tel. No. 26569303, 26569780, 26569784
Fax: 91-11-26852548
www.nipfp.org.in