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"Just Transition" in India and Fiscal Stance: Analyzing the Tax Buoyancy of the Extractive Sector

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ABSTRACT

Against the backdrop of fiscal transition concomitant to energy transition policies with climate change commitments, revenue from the extractive sector needs a recalibration in the subnational fiscal space. Extractive tax is the payment due to the government in exchange for the right to extract the mineral substance. Extractive tax has been fixed and paid in multiple tax regimes, sometimes on the measures of ad valorem (value-based) or profits or as the unit of the mineral extracted. Using the ARDL methodology, this paper analyzes the buoyancy of extractive revenue across the states in India, for the period 1991–92 to 2022–23 and analyzes the short- and long-run coefficients and their speed of adjustment. There are no identified structural breaks in the series predominantly because of the homogenous extractive policy regime shift to ad valorem from a unit-based regime. Our findings revealed that extractive tax is a buoyant source of own revenue, though there are distinct state-specific differentials. The policy implication of our study is crucial for a "just transition" related to climate change commitments where extractive industries' tax buoyancy is compared to other tax buoyancy across Indian states, and can be used as the *base scenario* to estimate the loss of revenue when fiscal transition sets in with "just transition" policies.

KEYWORDS: fiscal rules, energy transition, tax buoyancy, ARDL, extractive sector regime

JEL CODES: Q40, Q48, E62

INTRODUCTION

Against the backdrop of fiscal transition concomitant to energy transition policies with climate change commitments, revenue from extractive taxation needs a recalibration in the subnational fiscal space. Fiscal rules postulate that the threshold ratio of fiscal deficit to GDP is at 3.5 percent, with 0.5 percent of the states' extra borrowing space tied to structural reforms in the power sector. If the path to fiscal consolidation is through public expenditure cuts and not through increased tax buoyancy, the quality of fiscal consolidation would suffer as expenditure compression has adverse economic growth consequences.

However, with the climate change commitment, a "just transition" regime requires a smooth phasing out of fossil taxes, which are predominant sources of revenue. The major heads of revenue based on natural resource taxation are petroleum-based taxes and the mining royalties from the extractive sector industries. Bhandari and Dwivedi (2022) explored the fiscal and energy transition; and Bhandari et al. (2023) explored the dynamics of petroleum tax revenues and the fiscal implications of India's energy transition, with the government revenues generated from fossil fuels declining over time to net-zero carbon commitments. In this paper, we examine the fiscal dynamics of the extractive mining sector and its tax buoyancy.

The Mines and Minerals (Development and Regulation) Amendment (MMDRA) Bill, 2023, was passed in the Indian Parliament on August 2 of that year, in a bid to attract extractive private sector investment in the mining exploration. The MMDRA Bill 2023, restricted to government-owned entities, puts six minerals, including lithium into a list of "critical and strategic" minerals, which were previously classified as atomic minerals. In the context of these reforms and amendments related to the ways in which the extractive sector is regulated and taxed, there is a growing call to examine the buoyancy of extractive industries' taxation in comparison with other taxes.

This paper analyzes the buoyancy of extractive taxes in comparison to other direct and indirect taxes across 28 Indian states. The buoyancy is defined as the responsiveness of revenue to a change in the GDP. The extractive industries' taxation—the payment due to the

sovereign owner in exchange for the right to extract the mineral substance—is complex in how it is fixed and paid.

Extractive taxation has been fixed and paid in multiple extractive industrial regimes, sometimes on the measures of profitability, but more often ad valorem (value-based) or based on the unit of the mineral extracted. We have not used fossil-based taxation (petroleum taxes) in our paper. The extractive taxation from the mining rates is fixed by the central government (other than for minor minerals) and collected by the state governments.

In India, unlike other federations, extractive taxes are not included in the intergovernmental fiscal transfer mechanism within the divisible pool of tax sharing. The state governments collect revenue from the extractive industries in the form of mining royalties which is included in the non-tax revenue of the finance accounts of state governments. The paper is organized into four sections. Section 1 looks into regimes of extractive taxation. Section 2 presents the data sources and methodology. Section 3 presents the short- and long-term buoyancy estimates of extractive taxation in comparison with other direct and indirect taxes across major states in India. Section 4 concludes.

I. EXTRACTIVE INDUSTRIES' TAXATION REGIME IN INDIA

In India, the predominant regime of extractive taxation is the unit-based regime, which is determined with reference to the volume of production, or is determined with reference to gross revenues. It is also referred to as a tonnage-based regime. There is an increasing transition toward the ad valorem regime for many minerals in India. This extractive taxation regime is calculated by applying a percentage rate to the gross sale value. It is also referred to as a value-based regime. The profit-based regime is also present globally, where the taxation is calculated as a percentage of gross or net profit. The extractive taxation in India is onerous with high taxation rates in the world.

A tax buoyancy of one would imply that an increase in GDP by one percent would increase tax revenue also by one percent, thus leaving the tax-to-GDP ratio unchanged. From the perspective of meeting the FRBM targets, a tax buoyancy exceeding one is required. When

the tax buoyancy exceeds one, tax revenue increases more than GDP. If tax buoyancy is below unity, tax revenues are not increasing as much as GDP. We analyze the tax buoyancy for the period 1991–92 to 2022–23. The data for macro-fiscal variables are organized from state finance accounts and budget documents. The state-wise GSDP variables are collated from CSO. The data for GSDP is made comparable over the period of analysis using a splicing method.

The tax buoyancy is calculated using the following formula:

$\log (T) = a + b_1 \log (GSDP) + u$

where b_1 is the tax buoyancy, T is tax revenue, and GSDP is gross state domestic product. We have used time-series techniques to deal with the constraints of the short time series. The short-run buoyancy and long-run buoyancy estimates are reported with the speed of adjustment.

We used ARDL to estimate the dynamic time series.

$$(1) \qquad \Delta \ln y_{it} = \varphi_i y_{it-1} + \beta_i' x_{it-1} + \sum_{j=1}^{p-1} \lambda_{ij} \Delta \ln y_{it-j} + \sum_{q=1}^{q-1} \gamma_{ij}' \Delta \ln x_{it-j} + \mu_i + \xi_{it},$$
$$i = 1,2, \dots, N; t = 1,2, \dots, T$$

where y_{it} is the natural logarithm of tax revenue variable and x_{it} is the natural logarithm of GDP. We have not used a set of potential controls in the regression in the initial round. The coefficients on the $\varphi_i y_{it-1}$lagged dependent are the other explanatory variables, $\varphi_i y_{it-1}$are scalar coefficients on lagged first differences of dependent variables.

$\sum_{j=1}^{p-1} \lambda_{ij} \Delta \ln y_{it-j}$coefficient vectors on first differences of explanatory variables and their lagged values. ξ_{it}, is independently distributed across *i* and *t*, with zero means and constant variances. Equation (1) indicates that change in tax revenue can be determined by a distributed lag of order *p* of the dependent variable (tax), and a distributed lag of order *q* of GDP.

Assuming that $\theta_i' < 0$ for all *i*, there exists a long-run relationship between y_{it} and x_{it} :

$$(2) \qquad \ln y_{it} = \theta_i' \ln x_{it} + \eta_{it}, i = 1,2, \dots, N; t = 1,2, \dots, T$$

Equation (1) can then be rewritten as:

$$(3) \qquad \Delta \ln y_{it} = \varphi_i \eta_{it-1} + \sum_{j=1}^{p-1} \lambda_{ij} \Delta \ln y_{it-j} + \sum_{q=1}^{q-1} \gamma_{ij}' \Delta \ln x_{it-j} + \mu_i + \xi_{it},$$

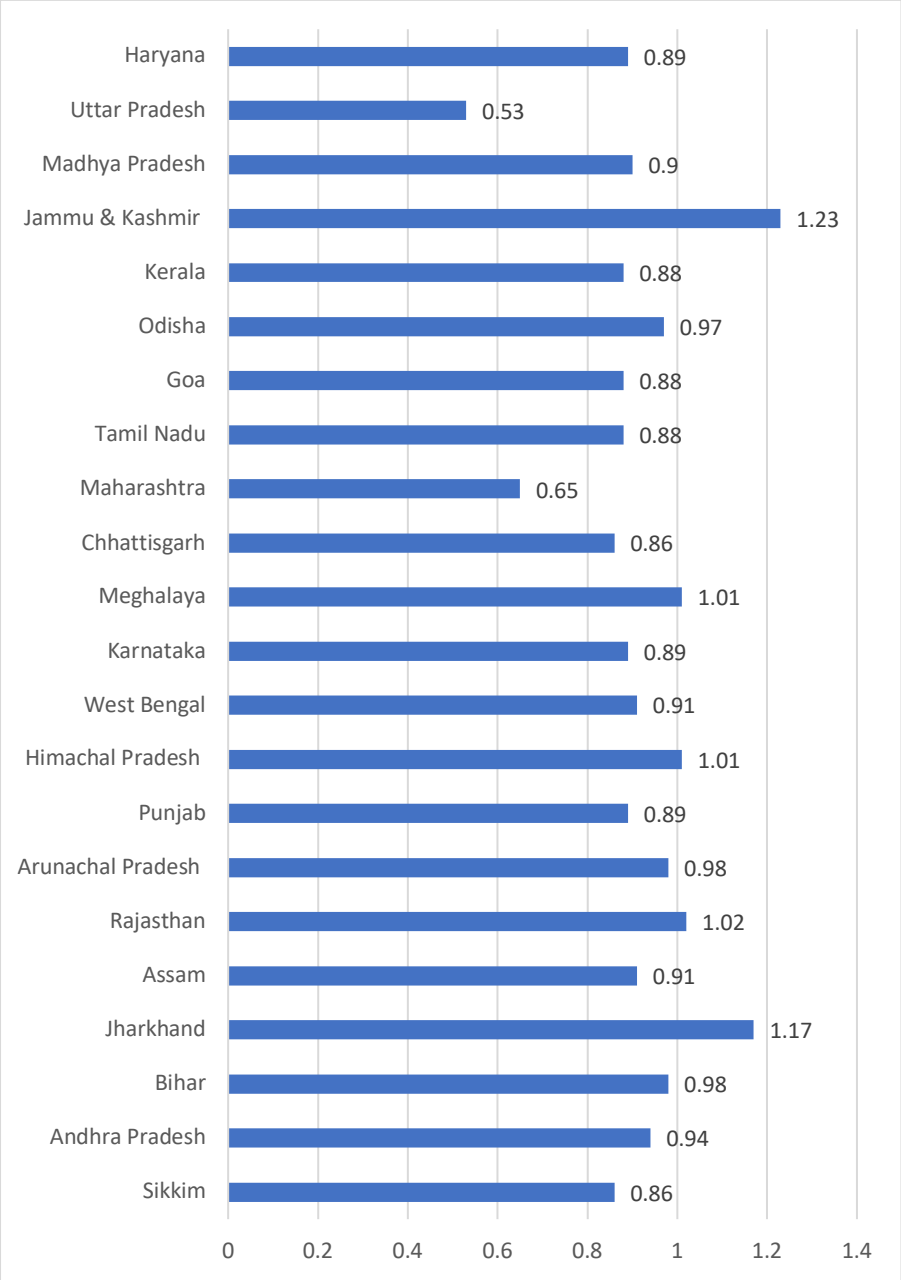
$$i = 1,2, \dots, N; t = 1,2, \dots, T$$

where η_{it-1} is the error correction term (that is, the deviation of variables at a certain point in time from their long run equilibrium), and φ_{ii} measures the speed of adjustment towards the long-run equilibrium. This specification allows us to capture the idea that an equilibrium relationship links revenue and GDP in the long-run, but that the dependent variable may deviate from its equilibrium path in the short-run (due, e.g., to shocks that may be persistent) (Dudine, Paolo, and Jalles 2017).

II. TAX BUOYANCY ESTIMATES OF INDIAN STATES

The tax buoyancy estimates for the period 1991–92 to 2022–23 showed that all states except Jammu Kashmir, Tamil Nadu, Gujarat, Andhra Pradesh, and Karnataka have tax buoyancy exceeding unity.

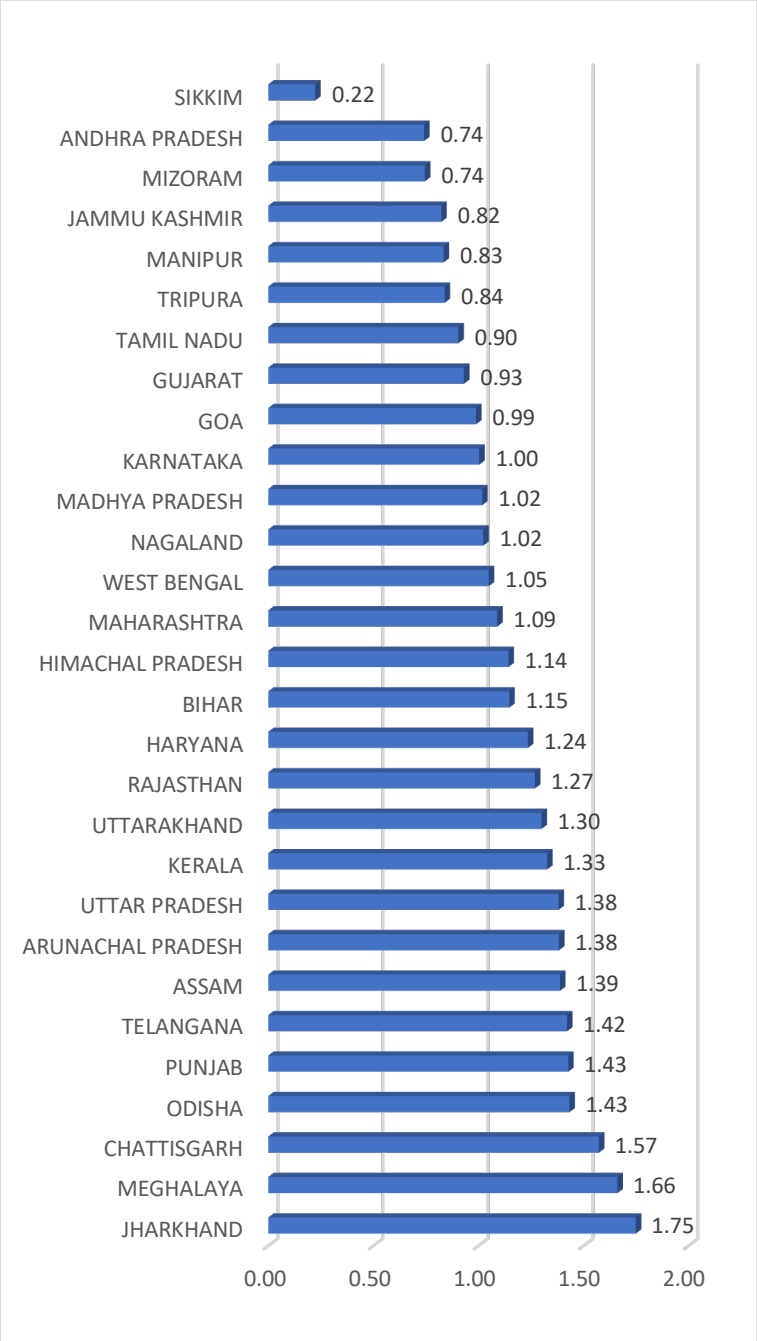
Figure 1. Own Tax Buoyancy Across States of India, 1991–92 to 2022–23



Source: Finance Accounts of States (various years), State Budget documents (various years) and CSO (various years)

The own revenue (tax plus nontax revenue) buoyancy is also calculated across states for comparison purposes (Figure 2). The total revenue buoyancy across states shows that except Sikkim (0.2), Andhra Pradesh (0.74), Mizoram (0.74), Jammu Kashmir (0.82), Manipur (0.83), Tripura (0.84), Tamil Nadu (0.90), Gujarat (0.93) and Goa (0.99), all other states have revenue buoyancy exceeding unity.

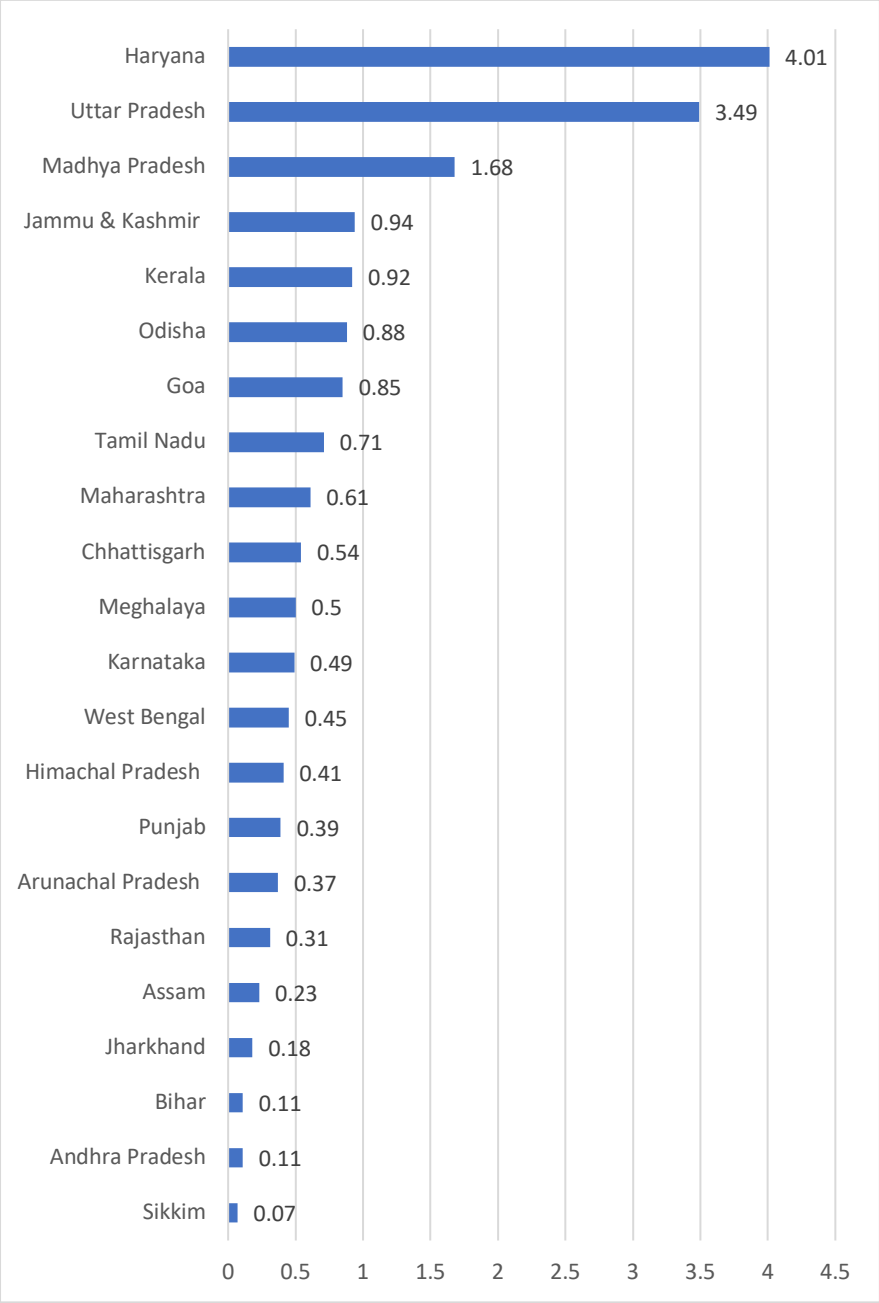
Figure 2. Total Own Revenue Buoyancy Across States of India, 1991–92 to 2022–23



Source: Finance Accounts of States (various years), State Budget documents (various years) and CSO (various years)

The non-tax revenue buoyancy of the states (Table 3) for the period from 1991–92 to 2022–23 reveals that, except Madhya Pradesh, Uttar Pradesh, and Haryana, all other states have a non-tax buoyancy less than one.

Figure 3. Own Non-Tax Revenue Buoyancy Across States of India, 1991–92 to 2022–23



Source: Finance Accounts of states (various years), state Budget documents (various years) and CSO (various years)

III. EXTRACTIVE TAXATION BUOYANCY ESTIMATES

An IMF working paper by Dudine and Jalle (2017) finds that tax buoyancies are generally equal to unity or greater for developed and less developed economies.

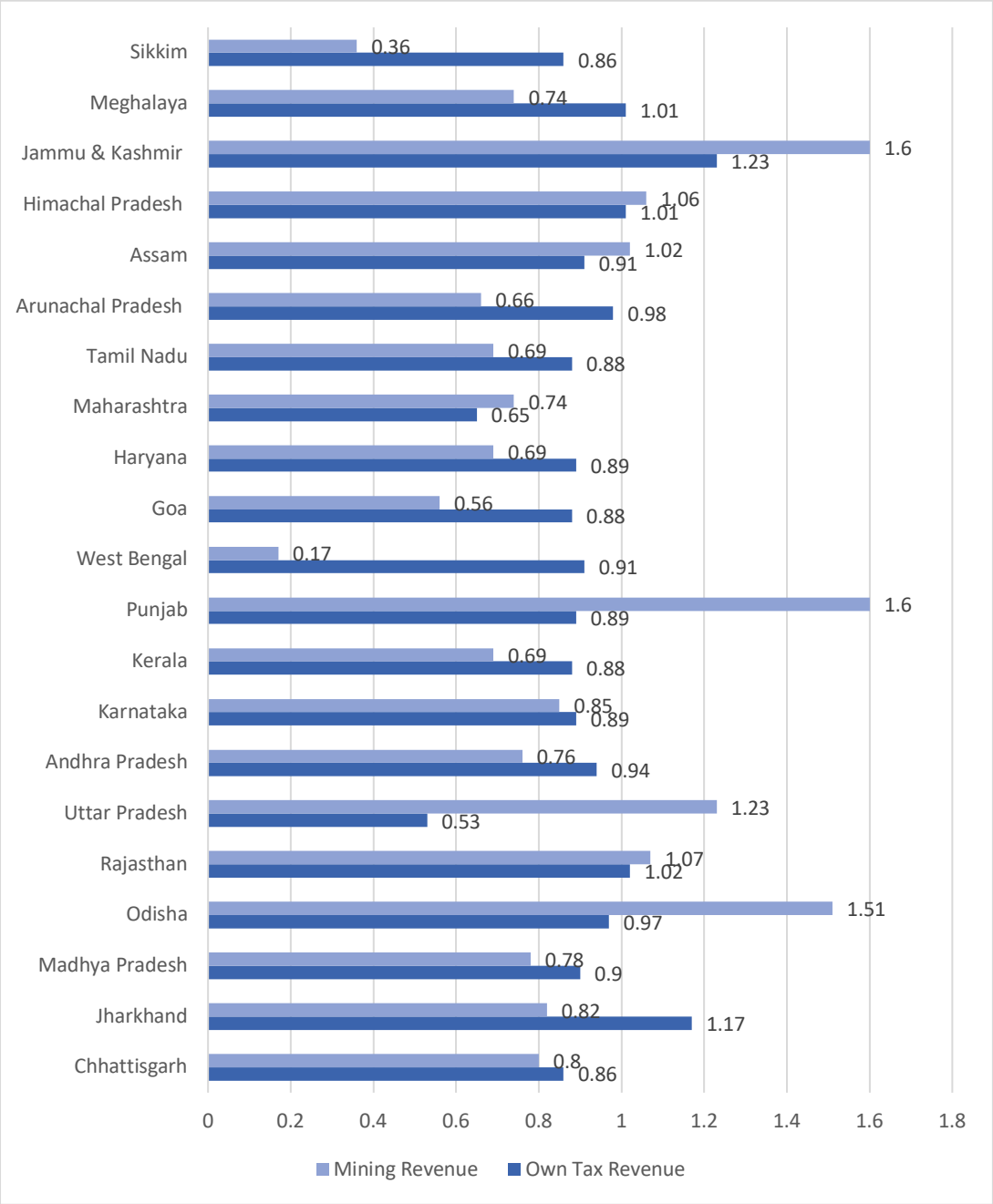
Tax buoyancy measures the response of tax revenue to a change in national income and the tax policy. Economists generally define it as the ratio of percentage change in tax revenue to a percentage change in income. Buoyancy can be estimated for the long term as well as for the short term. Short-term buoyancy above unity signifies that the tax system acts as an automatic stabilizer. Here, the tax system itself would automatically leave a greater proportion of income with the taxpayers during a slowdown, dampening the fall in demand. Similarly, during a boom, the system would automatically take away more income through taxes consequently slowing down the growth of demand. Such a tax system has a built-in stabilizer. In other words, the short-run buoyancy measures the instantaneous effect of a change in GDP on the tax revenue.

Long-run buoyancy is important in gauging the impact of the long-run growth of the economy on fiscal sustainability. Long-run buoyancy above unity would mean that faster growth would lead to better fiscal balance through the revenue side. This would be an important guiding principle while considering counter cyclical fiscal measures, meaning, an increased fiscal deficit would trigger growth, which can in turn generate more tax revenue, leading to the easing of fiscal pressure.

An Auto Regressive Distributed Lag (ARDL) model allows us to estimate the long- and short-run buoyancies along with the speed of adjustment. Speed of adjustment tells us how fast the buoyancy converges to the long-run equilibrium value.

Relatively low buoyancy for the states' taxes (1.04 for the long run and 1.19 for short run) will mean a reduced adverse impact of the slowdown on states as a whole. But the effect on individual states will depend on their buoyancies and the extent of deceleration of gross state domestic product of respective states. Short run buoyancy is found to be either equal to or less than unity for all the states. Bihar, Goa, Haryana, Jharkhand, Odisha, and Sikkim will be the states that would be least affected in the short run, with a buoyancy factor less than unity. For the long term, all states have buoyancies either equal to unity or greater than unity. Goa, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, West Bengal, Assam, Nagaland, and Sikkim have long-run buoyancy equal to one making them less vulnerable in the long run. Interestingly, most of the richer states fall in this category.

Figure 4. Buoyancies of Own Tax Revenue and Extractive Revenue Across States 1991–92 to 2022–23



Source: Finance Accounts of States (various years), State Budget documents (various years) and CSO (various years)

More detailed analysis of buoyancies of individual taxes including GST (where we have only a short time series) is essential. Though we have incorporated the optimal parameterization in the models by choosing the apt lag lengths, the estimates can be refined further by incorporating variables like inflation, structural variables, political factors, and business cycles in the tax buoyancy estimation models. At disaggregate-level analysis, it is also

important to see whether the buoyancy of divisible pool taxes is greater than the states' own taxes.

Table 1. Buoyancy of Own Tax Revenue of States, 1991–92 to 2022–23

	State	Long-Run Buoyancy			Short-Run Buoyancy			Speed of Adjustment
		<1	1	>1	<1	1	>1	
Low Income	Bihar		0.98*** (0.06)		0.21** (0.09)			-0.21* (0.12)
	Chhattisgarh	0.86*** (0.01)			0.66*** (0.08)			-0.77*** (0.07)
	Jharkhand		1.17*** (0.03)		0.47** (0.21)			-0.49* (0.25)
	Madhya Pradesh	0.90*** (0.02)			0.14* (0.07)			-0.15*** (0.01)
	Odisha		0.97*** (0.05)		-0.14 (0.13)			-0.06** (0.00)
	Rajasthan		1.02*** (0.01)		0.39*** (0.11)			-0.38*** (0.1)
	Uttar Pradesh	0.53*** (0.24)			0.87*** (0.29)			-0.54*** (0.14)
Middle Income	Andhra Pradesh	0.94*** (0.04)			0.07 (0.04)			-0.07*** (0.01)
	Karnataka	0.89*** (0.00)			0.29*** (0.07)			-0.33*** (0.02)
	Kerala	0.88*** (0.00)			0.57** (0.16)			-0.21*** (0.07)
	Punjab	0.89*** (0.01)			0.17** (0.06)			-0.19*** (0.02)
	West Bengal	0.91*** (0.03)			0.07* (0.04)			-0.08*** (0.00)
High Income	Goa	0.88*** (0.00)			0.19*** (0.04)			-0.21*** (0.02)
	Gujarat				0.81*** (0.19)			
	Haryana	0.89*** (0.01)			-0.16*** (0.06)			-0.18 (0.01)
	Maharashtra	0.65*** (0.13)			0.54*** (0.11)			-0.83*** (0.14)
	Tamil Nadu	0.88*** (0.00)			0.54*** (0.16)			-0.27** (0.07)
	Arunachal Pradesh		0.98*** (0.2)		0.4* (0.02)			-0.04*** (0.00)
	Assam	0.91*** (0.05)			0.49** (0.22)			-0.04** (0.01)
	Himachal Pradesh		1.01*** (0.02)		0.43* (0.13)			-0.42*** (0.10)
	Jammu & Kashmir			1.23*** (0.03)	0.42*** (0.11)			-0.34*** (0.08)

Special Category	Manipur			1.55***	0.17* (0.09)			-0.11* (0.01)
	Mizoram			1.46***	0.6*** (0.16)			-0.41* (0.10)
	Meghalaya		1.01*** (0.16)		0.03 (0.02)			-0.04*** (0.00)
	Nagaland			1.47*** (0.15)	0.58** (0.26)			-0.68** (0.27)
	Sikkim	0.86*** (0.03)			0.11* (0.05)			-0.13*** (0.01)
	Tripura	0.94*** (0.05)			0.05*** (0.01)			-0.05*** (0.00)

Note: *** p<0.01, ** p<0.05 and * p<0.1; GDP and GSDP data are from RBI database
Source: (Basic data), NIPFP database of Finance Accounts (various years).

Table 2. Categorization of States on the basis of Buoyancy of Own Tax Revenue, 1991-92 to 2022–23

Buoyancy of Own tax Revenue		**States**
Short-run Buoyancy	**>1**	Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttar Pradesh, Andhra Pradesh, Karnataka, Kerala, Punjab, West Bengal, Haryana, Maharashtra, Tamil Nadu, Assam, Sikkim, Tripura, Jammu & Kashmir, Manipur, Mizoram, Nagaland
Long-run Buoyancy	**>1**	Jammu & Kashmir, Manipur, Mizoram, Nagaland
	=1	Bihar, Jharkhand, Odisha, Rajasthan, Arunachal Pradesh, Himachal Pradesh, Meghalaya
	<1	Chhattisgarh, Madhya Pradesh, Uttar Pradesh, Andhra Pradesh, Karnataka, Kerala, Punjab, West Bengal, Haryana, Maharashtra, Tamil Nadu, Assam, Sikkim, Tripura

Source: (Basic data), NIPFP database of Finance Accounts.

Table 3. State-wise Estimates of Extractive Industries' Tax Buoyancy, 1991–92 to 2022–23

	State	**Long-Run Buoyancy**			**Short-Run Buoyancy**			**Speed of Adjustment**
		<1	**1**	**>1**	**<1**	**1**	**>1**	
Low Income	Bihar				0.08*** (0.02)			
	Chhattisgarh	0.8*** (0.01)			0.34*** (0.11)			-0.42*** (0.07)
	Jharkhand	0.82*** (0.01)			0.27*** (0.09)			-0.33*** (0.06)
	Madhya Pradesh	0.78 (0.01)			0.18* (0.07)			-0.23*** (0.05)
	Odisha		1.51*** (0.11)		0.47* (0.20)			-0.31*** (0.05)
	Rajasthan		1.07*** (0.03)		0.41** (0.16)			-0.38*** (0.04)

	Uttar Pradesh		1.23*** (0.09)		0.57*** (0.17)			-0.46*** -(0.11)
Middle Income	Andhra Pradesh	0.76*** (0.02)			0.14** (0.03)			-0.18*** -(0.05)
	Karnataka	0.85*** (0.01)			0.04* (0.02)			-0.04*** (0.01)
	Kerala	0.69*** (0.07)			0.04* (0.02)			-0.06*** (0.01)
	Punjab		1.6*** (0.08)		1.11*** (0.28)			-0.69*** (0.13)
	West Bengal	0.17* (0.09)	-			-		-
High Income	Goa	0.56*** (0.15)			0.30*** (0.09)			-0.43*** (0.13)
	Gujarat	0.75*** (0.01)			0.41*** (0.11)			-0.55*** (0.13)
	Haryana	0.69*** (0.02)			0.13*** (0.06)			-0.18*** (0.06)
	Maharashtra	0.74*** (0.02)			0.09*** (0.03)			-0.12*** (0.02)
	Tamil Nadu	0.69*** (0.01)			0.23*** (0.06)			-0.34*** (0.08)
Special Category	Arunachal Pradesh	0.66*** (0.05)					1.48 (0.96)	-0.15** (0.07)
	Assam		1.02*** (0.13)		0.52*** (0.17)			-0.51*** (0.15)
	Himachal Pradesh		1.06*** (0.05)		0.75*** (0.2)			-0.70*** (0.16)
	Jammu & Kashmir		1.6** (0.17)		0.45* (0.19)			-0.28*** (0.07)
	Manipur	0.18*** (0.05)			0.27*** (0.3)			-0.65*** (0.17)
	Mizoram							
	Meghalaya	0.74*** (0.01)			0.31*** (0.08)			-0.42*** (0.1)
	Nagaland	0.45*** (0.02)			0.25*** (0.07)			-0.55*** (0.15)
	Sikkim	0.36*** (0.01)			0.24 (0.06)			-0.67*** (0.16)
	Tripura	-	-		-	-	-	

Notes: *** p<0.01, ** p<0.05 and * p<0.1
GSDP data are from RBI database
Source: Mining revenue data is from NIPFP database of Finance Accounts.

There are no structural breaks in the series as there is no policy regime shift in the period of analysis (the transition from unity-based to an ad valorem regime happened prior, and

remained stable). A disaggregated analysis of a ferrous regime and non-ferrous, non-atomic regime of the extractive sector is beyond the scope of this paper as there is no readily available data on disaggregated revenue heads in the state finance accounts. The post-pandemic years are included as there is no huge volatility in the extractive revenue generated in those years, and hence no structural breaks.

IV. CONCLUSION

Using the ADRL methodology, we have tried to estimate the revenue buoyancy of extractive industries' taxation and analyzed the short- and long-run coefficients and their speed of adjustment, for the period 1991–92 to 2022–23. Our findings revealed that extractive taxation is a buoyant source of revenue comparable to the buoyancy coefficients of other taxes across states, though the coefficients are not always above unity across the states. The policy implication of our study for the climate change commitments is significant when fiscal transition becomes inevitable with energy transition policies. These subnational tax and non-tax buoyancy estimates can provide a baseline scenario for analyzing the subnational fiscal space against the backdrop of net-zero carbon–related climate change commitments.

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