

Tax Buoyancy in Assam: An Empirical Exploration

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Abstract:

An attempt has been made in this paper to analyse the tax buoyancy rate of Assam state empirically. Tax buoyancy is crucial for a state, as it indicates how well tax revenue grows with economic activity (GDP), supporting efficient fiscal planning, reducing reliance on debt, and enabling better funding for public spending without raising rates. The indirect tax structure in India underwent a fundamental transformation from fragmented to integrated when sales tax was replaced by Value Added Tax (VAT) in 2005, and further Goods and Services Tax (GST) in 2017, which combined several indirect taxes (such as VAT, Excise Duty, Service Tax, and CST) into a single destination-based tax. This created a common national market, eliminated the cascading effect (tax on tax), made compliance easier with unified forms, and enabled seamless Input Tax Credit (ITC) across states. Therefore, it is very significant to examine how state GST implementation enables the state to make use of its tax base (GSDP) in order to boost revenue mobilisation and, consequently, tax buoyancy. In this regard, the primary goal of this paper is to investigate the effects of state GST on the tax buoyancy of Assam, and the tax to GSDP ratio before and after the implementation of the state GST. In addition, the regression results of different minor heads under Own Tax Revenue are also investigated. The study found that tax buoyancy was 0.79 between 2010-11 and 2016-17, showing that own tax revenue increased more slowly than state revenue. On the other hand, the tax buoyancy rose to 1.10 between 2017-18 and 2024-25, suggesting that tax revenue expanded more quickly than state revenue. This reflects a significant improvement in the efficiency and responsiveness of the tax system in Assam. The implementation of the Goods and Services Tax (GST), improved tax compliance, better administration, and overall economic growth are some of the reasons for the higher buoyancy.

Key Words: Own Tax Revenue (OTR), Gross State Domestic Product (GSDP), Tax Buoyancy, Goods and Services Tax, Fiscal Policy, State Finance.

1. Introduction:

The response of tax revenue to changes in income has frequently been identified as a crucial measure for evaluating the effectiveness of a tax system in a developing country. To measure this response, tax buoyancy and elasticity are used (Mukherjee, 2020). The tax buoyancy estimate, typically measured by the gross state domestic product (GSDP), calculates the percentage change in tax revenue for a one per cent change in the tax base (Dey, 2025). If tax receipts rise more than proportionately in response to an increase in GSDP, the tax is considered to be buoyant. It is very difficult to assess the elasticity of tax income with any appreciable degree of accuracy in developing countries since policy parameters change annually and occasionally throughout the year (Gupta et al., 2022). Therefore, the study has computed the tax buoyancy of its own tax revenue for simplicity's sake.

Indirect tax is a very significant source for generating consistent, wide-ranging revenue, supporting public services, and promoting economic involvement through spending across all income levels (Neog & Gaur, 2020). This indirect tax structure in India underwent a fundamental transformation from fragmented to integrated when sales tax was replaced by Value Added Tax (VAT) in 2005, and further Goods and Services Tax (GST) in 2017, which combined several indirect taxes (such as VAT, Excise Duty, Service Tax, and CST) into a single destination-based tax (Mukherjee, 2020). This created a common national market, eliminated the cascading effect (tax on tax), made compliance easier with unified forms, and enabled seamless Input Tax Credit (ITC) across states (Bhalla et al., 2023). Therefore, it is very significant to examine how state GST implementation enables the state to make use of its tax base (GSDP) in order to boost revenue mobilisation and, consequently, tax buoyancy. In this regard, the primary goal of this paper is to investigate the effects of State GST on the tax buoyancy of Assam. In addition, the tax to GSDP ratio before and after the implementation of the State GST is also examined.

2. Literature Review:

In economic literature, a study of tax buoyancy would undoubtedly gain importance. To fill any gaps, a few of these studies, carried out in India and elsewhere, have been briefly reviewed below. According to Charles, Paraguay's tax-to-income ratio significantly expanded between 1962 and 1970, rising from 5.0 to 10.7 per cent

of GDP in terms of tax revenue. Although the overall tax system's elasticity was 1.14 during the study period, the elasticities of the various taxes varied significantly (Mansfield, 1972). Purohit found that income elasticity exceeded unity in half of the Indian states during 1960-61 and 1970-71. The states of Andhra Pradesh, Gujarat, Karnataka,

Maharashtra, Tamil Nadu, West Bengal, Haryana, and Punjab have high built-in-flexibility values (ranging from 1.04 to 1.60). Assam, Bihar, Kerala, Madhya Pradesh, Odisha, Jammu & Kashmir, and Uttar Pradesh all had an inelastic tax structure with elasticity less than unity (Purohit, 1981). Land revenue and agricultural income were shown to be income inelastic in every state except Karnataka. The responsiveness of the taxes imposed in the states of Punjab and Haryana during 1969-70 and 1977-78 to shifts in their income was examined and compared by Sethi and Teja (Sethi & Teja, 2014). The study, which covered the years 1950-51 to 2003-04, found that Haryana's taxes were comparatively more flexible than Punjab's, both collectively and individually. (Rajaraman et al., 2006) stated that the buoyancy coefficients essentially measure the underlying revenue-generating properties of the system under endogenous tax policy if they are estimated over a sufficiently long period of time. Sethi & Teja (2013) used time series data on six fiscal aggregates spanning 26 years (from 1985 to 2010) to analyse trends and factors influencing fiscal deficit for five northern Indian states (Punjab, Haryana, Himachal Pradesh, Jammu & Kashmir, and Uttar Pradesh). Pedroni (2004) also used Frisch's confluence analysis on panel data to find the key reasons for fiscal deficits in 17 major Indian states. They found that encouraging the services sector, efficiently collecting sales tax, and reducing non-development spending would all be expected to reduce fiscal deficit among the states. Strict enforcement of tax evasion and the imposition of taxes on big farm holdings, albeit at marginal rates, could be helpful in this regard. Since the implementation of the GST, India's tax collection has become less susceptible to changes in GDP, claim Paliwal (Paliwal et al., 2019). This shows that the tax load on businesses and consumers has been minimised since the GST was implemented, which is consistent with the government's justification for enacting the tax. Dhingra (2005) used the Nerolovian Partial Adjustment mechanism to examine both short-term and long-term tax buoyancy and found that the growth rate of tax revenue will outpace the growth rate of income during the research period, as long-term tax buoyancy is positive and surpasses one. Maddala & Wu (1999) assess the impact of GST on GDP and key fiscal indicators, such as the fiscal deficit. The findings indicate that after the GST was implemented, tax revenue rose in line with GDP growth. Regression analysis tells that indirect tax revenues largely influence India's budget deficit. The Goods and Services Tax has become a successful system that controls revenues and promotes sustained economic growth, even though it had some problems at first.

3. Data and Methodology:

Secondary sources of knowledge form the basis of the study. The annual data on Own Tax Revenue (OTR) and Gross State Domestic Product (GSDP) of the state of Assam for the period of 15 years (from 2010-11 to 2024-25) are taken from Statistical Handbooks of Assam and Budget Reports. Finance Accounts, Govt. of Assam. Both GSDP and Own Tax Revenue (OTR) data are collected at the current market prices, as the goal of this analysis is to determine the tax buoyancy rates. The study has considered the 2016-17 period as a benchmark for splicing the years between two periods (pre and post GST implementation), to make a comparative analysis of the study. The linear regression model has been used to estimate tax buoyancy rates over 15 years, because its slope coefficient indicates the GSDP coefficient for Assam (Hamid, 2023). Tax Buoyancy is derived by using the following formula:

Tax Buoyancy = The percentage change in Tax / The percentage change in Tax Base

The formula of the linear regression model is:

$$\ln(OTR_t) = a + b \ln(GSDP_t) + E_t$$

Where,

OTR_t = Own Tax Revenue at current market prices (in Rs. Crores) at time t.

$GSDP_t$ = Gross State Domestic Product at current market prices (in Rs. Crores) at time t.

a = Intercept.

b = GSDP coefficient

E_t = Error term at time t.

a and **b** are parameters to be estimated, and **E** is the stochastic disturbance term.

4. Findings: (Before the implementation of Goods and Services Tax).

SPSS software was used to obtain the following results. The period covered is 7 years from 2010-11 to 2016-17

Descriptive Statistics

	Mean	Std. Deviation	N
VAR00001	8921.5714	1945.46968	7
VAR00002	181233.2229	49178.20669	7

Correlations

	VAR00001	VAR00002
Pearson Correlation VAR00001	1.000	.983
VAR00002	.983	1.000
Sig. (1-tailed) VAR00001	.	.000
VAR00002	.000	.
N VAR00001	7	7
VAR00002	7	7

ANOVA^a

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	21948766.243	1	21948766.243	144.334	.000 ^b
Residual	760347.472	5	152069.494		
Total	22709113.714	6			

Dependent Variable: VAR00001

Predictors: (Constant), VAR00002

Coefficients

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations		
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part
Constant	1873.106	604.923	.983	3.096	.027	318.101	3428.111	.983	.983	.983
VAR00002	.039	.003		12.014	.000	.031	.047			

Dependent Variable: VAR00001

5. Interpretation of the Findings

The correlation table shows the strength of the relationship between two variables, Own tax Revenue and Gross State Domestic Product. With Pearson correlation (r)=0.983 and Significance = 0.000, there is a very strong positive correlation between GSDP and OTR in Assam. As income increases, tax revenue increases almost proportionately.

In the Regression table, the F-statistic = 144.334 and Significance (P-value) = 0.000.

This represents that the regression model is statistically significant at the 1% level, which means GSDP is a highly significant determinant of tax revenue in Assam.

The coefficient table depicts the regression equation as:

$$OTR_t = 1873.106 + 0.039 (GSDP_t) + E_t$$

Here, the GSDP Coefficient (b) =0.039, which means a one unit increase in GSDP increases tax revenue by 0.039 units, holding other factors constant.

The standardised coefficient (Beta = 0.983) shows GSDP is an extremely strong predictor of tax revenue.

In the log-log regression model, the coefficient and the buoyancy term are the same. But the model used in this study is only a linear regression model. Therefore, buoyancy is derived by using the following formula:

Tax Buoyancy = The percentage change in tax revenue / The percentage change in GSDP

Using regression elasticity approximation: Tax Buoyancy = $b \times \text{Mean GSDP} / \text{Mean tax revenue}$

Substituting values:

Tax Buoyancy = $0.039 \times 181233.22 / 8921.57 = 0.79$

Therefore, Tax Buoyancy = 0.8

Since buoyancy < 1, tax revenue is not buoyant.

It depicted that, before the implementation of GST, tax revenue grows slower than the overall economy of Assam. This shows a less responsive tax system where revenue does not keep pace with economic growth, potentially leading to larger fiscal deficits and a lower tax-to-GDP ratio.

6. Findings: (After the implementation of Goods and Services Tax).

SPSS software was used to obtain the following results. The period covered is 8 years from 2017-18 to 2024-25.

Descriptive Statistics

	Mean	Std. Deviation	N
VAR00001	21146.1250	7171.08783	8
VAR00002	422984.9763	130441.88825	8

Correlation

		VAR00001	VAR00002
Pearson Correlation	VAR00001	1.0000	.994
	VAR00002	.994	1.0000
Sig. (1-tailed)	VAR00001	.	.000
	VAR00002	.000	.
N	VAR00001	8	8
	VAR00002	8	8

Model Summary

Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate	R Square Change	F Change	df 1	df 2	Sig. F Change	Durbin-Watson
1	.994 ^a	.987	.985	867.62222	.987	472.197	1	6	.000	3.125

Anova

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	355454894.923	1	355454894.923	472.197	.000 ^b
Residual	4516609.952	6	752768.325		
Total	359971504.875	7			

a. Dependant Variable: VAR00001

b. Predictors: (Constant), VAR00002

Coefficients

Model	Unstandardised coefficients		Standardised Coefficients	t	Sig.	95% Confidence Interval for B		Collinearity Statistics
(Constant)	B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance
VAR00002	-1961.276 .055	1106.742 .003	.994	-1.772 21.730	.127 .000	4669.376 .048	746.825 .061	1.000

a. Dependent Variable: VAR00001

7. Interpretation of the Findings:

With Pearson correlation (r)=0.994 and Significance=0.000, there is a very strong positive correlation between GSDP and OTR in Assam. As income increases, tax revenue increases almost proportionately.

With, $R=0.994$, $R^2 = 0.987$, Adjusted $R^2 = 0.985$ and Std. Error = 867.62,

It is found that about 98.7% of the variation in tax revenue is explained by GSDP, which explains an excellent model fit, meaning tax revenue in the GST period is highly dependent on economic growth.

In the Anova table, it is found that the F-statistic = 472.197 and Significance (P-value) = 0.000.

This reflects that the regression model is statistically significant at the 1% level, meaning GSDP has a meaningful impact on tax revenue after the implementation of GST.

The coefficient table depicts the regression equation as:

$$OTR_t = -1961.276 + 0.055 (GSDP_t) + E_t$$

Here, GSDP Coefficient (b)=0.055, which means a one unit increase in GSDP increases tax revenue by 0.055 units, holding other factors constant. The impact is highly significant.

The standardised Beta (0.994) shows GSDP is an extremely strong predictor of tax revenue.

In the log-log regression model, the coefficient and the buoyancy term are the same. But, the model used in this study is only a linear regression model; therefore, buoyancy is derived by using the following formula-

$$\text{Tax Buoyancy} = \% \text{ change in tax revenue} / \% \text{ change in GSDP}$$

Using regression elasticity approximation: Tax Buoyancy = $\frac{b}{x} \times \text{Mean GSDP} / \text{Mean tax revenue}$

Substituting values:

$$\text{Tax Buoyancy} = 0.055 \times 422984.98 / 21146.13 = 1.10$$

Therefore, **Tax Buoyancy = 1.10. Since buoyancy > 1, tax revenue is buoyant.**

This depicts that Own Tax Revenue is growing faster than GSDP in the post-GST period. Therefore, GST has improved tax responsiveness, efficiency, and revenue mobilisation in Assam

8. Testing of Autocorrelation:

Since this study is based on time-series data over 15 years and uses linear regression with one dependent and one independent variable to estimate the tax buoyancy rate, the data may exhibit autocorrelation, meaning that the error term in this model might be correlated over time.

To check for autocorrelation in SPSS, use the Durbin-Watson statistic. and found that

Durbin-Watson value= 1.797

Since the value lies within the range 1.5 and 2.5, no serious autocorrelation in this study.

9. Regression results of different minor heads under Own Tax Revenue:

The following table depicts the regression results of different minor heads under their own tax revenue. The table shows the comparative analysis between two different economic situations- pre-GST (2010-11 to 2016-17) and post-GST (2017-18 to 2014-15). To evaluate the responsiveness of tax revenue to economic growth, and for testing autocorrelation in the regression model, the constant (a), tax buoyancy (b), and Durbin-Watson (DW) statistics are examined.

2010-11 to 2016-17				2017-18 to 2024-25		
Minor heads under OTR	a (Constant)	b (Buoyancy)	Durbin-Watson Value	a (Constant)	b (Buoyancy)	Durbin-Watson Value
GST				-15527.37	2.45	1.9
Sales Tax	1590.45	0.76	2.34	-2107.12	1.36	1.3
State Excise Duty	-103.91	1.21	1.51	-4174.31	2.85	2.35
Agricultural Tax	164.358	-2.33	1.345	6.833	----	1.978
Land Revenue	68.848	0.93	1.99	-293.86	2.60	1.33
Stamps and Registration	84.007	0.75	1.620	204.69	0	1.315
Taxes on Motor Vehicle	31.747	0.85	1.48	-1863.52	2.65	1.5

Taxes on Goods and Passenger	73.59	0.84	1.08	333.892	-6.7	1.64
Other Taxes on Income and Expenditure	143.89	0.00	1.5	85.75	0.00	2.0

The table shows that during the pre-GST period, the majority of taxes under their own tax revenue exhibit buoyancy values less than 1, representing comparatively inelastic revenue growth in relation to economic activity. For example, there is a slow growth responsiveness in Land Revenue (0.93), Stamps and Registration (0.75), Motor Vehicle Taxes (0.85), Sales Tax (0.76), and Taxes on Goods and Passengers (0.84). On the other hand, State Excise Duty exhibits buoyancy greater than one (1.21), which suggests greater revenue responsiveness. The Durbin-Watson values lie between 1 and 2, which shows that during the pre-GST period, moderate autocorrelation exists. There is a visible structural shift in tax responsiveness during the post-GST period (2017-18 to 2024-25), explaining the positive effects of tax reforms on revenue generation. The high buoyancy of Land Revenue (2.60), State Excise Duty (2.85), Motor Vehicle Taxes (2.65), Sales Tax (1.36), and GST (2.45) depicted that these revenue sources are increasing more rapidly than the tax base. This reveals the picture of increased revenue mobilisation and tax efficiency in the post-reform era. On the other hand, a few taxes, such as the Agricultural Tax, Taxes on Goods and Passengers, exhibit negative buoyancy, indicating a significant drop in revenue performance, perhaps as a result of policy restructuring or changing tax bases due to the implementation of GST, which may have led to reduced consumption or shifts in spending patterns among consumers.

9. Conclusion:

Assam's fiscal health and tax collection efficiency have significantly improved when state tax buoyancy increases from 0.8 to 1.10, which represents a change from a less-than proportionate growth in tax revenue (in relation to GDP) to a more-than proportionate growth. It indicates that Assam's tax performance has clearly improved over time. The tax buoyancy was 0.79 between 2010-11 and 2016-17, showing that own tax revenue increased more slowly than state revenue. This represented a comparatively low revenue response, which may be due to a low tax base, inefficient administration, or slow economic growth in this state. When the tax buoyancy is 1.10 between 2017-18 and 2024-25, it explains that tax collections increase by 1.10% for every 1% increase in the state's GDP. This means tax revenue expanded more quickly than state revenue.

The regression analysis of minor heads under their own tax revenue explained the positive effects of the implementation of GST on revenue generation. This reflects a significant improvement in the efficiency and responsiveness of the Assam tax system. The state's fiscal deficit improved. The government of Assam is also able to generate sufficient revenue to fund social welfare programs. Therefore, one of the strongest reasons for higher tax buoyancy is the implementation of the Goods and Services Tax (GST), which has improved tax compliance, administrative efficiency, and overall economic growth. The regression model does not have significant autocorrelation problems, according to the Durbin-Watson statistics (roughly 1.3 to 2.35). This suggests that the models provide reliable estimates, supporting the validity of the conclusions drawn from the analysis.

Future research could explore the long-term implications of these reforms on economic growth and expenditure efficiency.

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