

Effect of Personal Income Tax Reforms on Tax Revenue in India - A Study of Pre-and-Post Liberalization Era

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ABSTRACT

The paper analyses the effect of personal income tax reforms on personal income tax revenue both in pre and post reform periods. The present paper uses the Enter method of Multiple Linear Regressions, t-test, ANOVA for analysis and covers forty years i.e. started from 1971 to 2010 for study. The paper found that MTR_{min} and MTR_{max} have their effect on PITR in pre liberalization era because there was progressivity in personal income tax rates before 1991 but both are not showing their effectiveness on revenue in post liberalization era. On the other hand, PITR is highly persuaded by TS_{min} and TS_{max} in post reform phase. Increasing in number of assesseees and tax-GDP has an influence on personal income tax revenue both in pre and post liberalization era. COC is excluding in personal income tax reform variables both in pre and post liberalization phase, just a reason of multicollinearity with other reform variables. TB reveals an insignificant effect on personal income tax revenue equally in pre and post liberalization epoch. The paper suggested that if the State widened the minimum tax slab it would be resulted in high tax revenue because mass population is residing between first two income tax slabs.

Keywords: *Personal income tax reforms; personal income tax revenue; pre and post liberalization era; personal income tax rates and tax slabs.*

INTRODUCTION

Income tax occupies a dominant place in the Direct Taxes. Income tax is charged on the income because income has long been recognized as an appropriate tax base as it happens to be a comprehensive indicator of the ability to pay. The ability to pay tax means the distribution of the tax burden according to the economic capacity of the taxpayer. Despite the thinking that consumption taxes are more equitable than income and wealth taxes, personal income continues to be an important tax base in developed as well as developing economies. Tax on personal income is also related with nation's economic performance. The merit of personal income tax lies in the fact that it permits incorporation of the features of a modern tax in the sense that it can take into consideration of the taxpayer's needs and it is adaptable to progressive rate and its yield can

also be highly elastic and thus it has a great appeal as a modern tax. So that the Government can raise high personal income tax revenue through effective tax policies. Because, an effective tax policy can play a very important role in countering the financial and economic crisis. This is well analysed by Wohlbier *et. al.* (2010) in their study. In which they examined the effect of tax reforms and tax policy on tax revenue in European Union (EU) Member State. Wohlbier *et. al.* gave a detailed discussion regarding tax reforms, tax policy and covered a number of content like tax structure & recent developments in E U, tax composition, recent reforms of tax system in EU tax policy issues related to the crisis, taxation and growth of internal market. After studying various factors in tax system the study suggested that tax reforms helps to boost public finance in a growth- friendly way, after a huge financial crisis in the world economy during 2007-08. The study also concluded that direct taxes paid one third of overall tax revenue in long- run¹. Another study conducted by Chatagny and Soguel (2011) examined twenty six Swiss cantons by using panel data of twelve years. The study built a single equation regression model on fiscal balance as well as a simultaneous equation regression model on revenue and expenditure. The study found that tax revenue is definitely reduced fiscal deficits and imbalances². Thus tax revenue helps in controlling fiscal and economic imbalances.

The paper is divided in five sections which are as follows: Section I provides a brief review of the literature related with the current paper. In the next section, the paper describes the objective and research methodology used in this paper. Following this, in the third section the paper discuss the results on the basis of required information. A brief findings and conclusion is provided in the fourth section. Policy implications are given in the fifth and last section

SECTION I: REVIEW OF LITERATURE

Acharya (2007) analyzed India' growth performance from 1950 to 2005. The study divided this period into five sections and covered all economic reforms including tax reforms. The study found that after independence Indian economy has faced many problems like foreign exchange crisis, wars and drought etc, and found difficult in its growth performance, but after trade liberalization and tax reforms, India got pace in its growth and establish itself as developing country. India's growth at an average rate of almost 6 percent a year over the past quarter of a century is both remarkable and commendable. The study made a conclusion of India' growth performance with comparison of China's growth and found India's growth has been propelled more by; domestic consumption than external demand, weak services and infrastructural facilities as compared to China. If India made a balance in these fields than the growth picture would be different. **Jha (2007)** presented a broad overview of fiscal issues confronting developing countries. The three major issues, which were discussed in this study, are; i) developing countries have low tax/GDP and expenditure/GDP ratios compared to developed countries; ii) developing countries fiscal stance is often pro-

cyclical; iii) developing country tax resources are more volatile than those of developed countries. The study suggested that some key areas of fiscal policy in developing countries are: their taxes, expenditure and intergovernmental transfer prices, if there would be any improvement in these areas, it would be helpful in balancing fiscal deficits.

Poirson (2006) examined the effects of Indian tax system and tax reforms on growth, with the help of productivity and level of private investment and made a comparison of Indian indicators of effective tax rates and tax revenue productivity with other countries. The study concluded that the most recently proposed package of reforms would improve tax productivity and lower the marginal tax burden and tax-induced distortions, but the firms that rely on internal sources of funds or face problems borrowing would continue to face high marginal tax rates. **Pang, Pinto and Wes (2006)** examined the Indian-East- Asian growth and Latin American deficits. Over the past 25 years, India's economy grew at an average real rate of close to 6 percent, yet by the end of this period, the general government debt-to-GDP ratio was 34 percentage points higher. The study characterized the fiscal adjustment during the 1990s in simple terms: revenues from trade, excise and financial repression taxes fell significantly as a result of economic reforms following the 1991 crisis; capital expenditure was cut to compensate. The study concluded the Indian growth and fiscal deficits by three stages, which explained the tax reforms growing private investment, import competition and industrial development, each embodying an immense challenge: at the revenue level.

Bernardi and Fraschini (2005) studied the tax system and tax reforms in India. The study measured the growth of GDP and fiscal pressure of central and state governments. Using the data of a wider research on South- East Asian countries' taxation carried on under the supervision of V. Tanzi, the study examined that a tax system of a country like India is unavoidably raising more than one problem like large dominance of a complex and obsolete indirect taxation and fiscal relations among government layers. The study concluded that the road to update and improve the Indian tax system is still largely to be accomplished. A complex structure of taxes on goods and services is largely the main heading of the tax system and it is difficult to move towards a VAT-kind structure. **Rao and Rao (2005)** examined the trends and issues in tax policy and reform in India. The study showed that most developing countries, which were guided in their tax reforms by multilateral agencies, Indian tax reform attempts have largely borne a domestic brand. But despite this, the tax reforms of India were broadly in conformity with international trends and an advice proffered by expert groups and was in tune with international best practices. And the study concluded that reforms should be undertaken at central, state as well as local levels, so that distortions should be minimized and tax revenue should be increased. **Geda and Shimles (2005)** examined the taxes and tax reforms in Ethiopia over the period from 1990-2003. The study made an attempt to explore the contribution of tax reform,

the changes in its structure and institutional reform in order to understand its role in raising revenue. The study covered other reforms also which were initiated by Ethiopian Revolution Democratic Front (EPRDF), in contrast to previous 'socialist' regime. The conclusion was made that, although it is too early to evaluate the effect of these reforms, the overall result shows that tax revenue has been increasing over the recent past.

Auerbach & Hassett (1999) and **Gale & Orszag (2003)** found that reforms are ultimately having economic effects, which generate equilibrium between distribution and incentives. **Sakbani (2010)** and **Hudson & Maioli (2010)** analyzed that fiscal reforms are necessary for improving the fiscal imbalances. **Tanzi and Zee (1996)** showed empirical evidences that exhibits fiscal policy could play a fundamental role in affecting the long-run growth performance of countries. Fiscal reforms include tax reforms and tax reforms are played a major role in reducing fiscal crisis and improving growth. Following the reforms India has a very impressive growth rate after 1991. The high GDP improves India's relations with all major powers, especially the US. So as India is trying to develop a more balanced relationship with all of the major Asian economies, as well seen by **Sen et. al. (2004)**, **Kefela (2009)** and **Moyi and Muriithi (2003)** observed that effective tax policies (includes tax reforms) can help in increasing tax revenue and economic growth.

Research gap identified: After having discussion on review of literature it is found that most of the studies are examined either one or two direct tax reform variable's effect on tax revenue but not even a single study tells us eight to ten personal income tax reform variables and their effect on personal income tax revenue. There is hardly any study which has studied such a large number of direct tax reform variables that are covered in the present paper. Further, the time period and sample size of majority of the studies is not adequately large to make same representation. So this is the major reason of conducting the present paper. The paper tries to examine the above raised questions.

SECTION II: RESEARCH METHODOLOGY

The present section gives a description about the objectives of the paper and the methodology used in this paper. It explains the methods of research, sources and tools covered by the paper.

Objectives of the Study: To find the answer of questions raised earlier, the present paper attempt:

- (i) To study the personal income tax reforms on personal income tax revenue in pre liberalization period;
- (ii) to examine the personal income tax reforms on personal income tax revenue in post liberalization period;
- (iii) to consider lay forward and proposing the workable suggestions to make the income tax reforms an unbeaten process.

RESEARCH METHOD AND TOOL

Parametric test Multiple Linear Regression Model, t-test and ANOVA are put into application for analysis. One of the three assumptions used in parametric test is that residuals are normally distributed as analyzed by Gujarati (2004). The residuals are assumed to be independently and identically distributed normal random variables, each variable with mean zero and same variance; see (Chatterjee and Hadi, 2006). Shapiro-Wilk W statistic is applied for checking normality. Shapiro-Wilk W is the ratio of best estimator of the variance to the usually sum of square estimator of the variance (Shapiro-Wilk, 1965). For the normality of residuals variables should be normal and variables used in current study are not supporting the assumption of normality. Micceri (1989), Marling and Gurn (2010) points out that true normality is exceedingly rare in education and psychology, but human behaviour is affected by normality. Transformation of variables is one of the solutions to problem as well explained by Cooper and Schindler (2006) and Aykin (2009). Transformation is usually applied so that the data appear to more closely meet the assumptions of linear regression and also to improve the interpretability or appearance of graphs. The researcher has applied natural log to transform the data to normality

Sample Size: A sample of forty years is taken for study of secondary data. The sample time period is from 1971- 2010 is divided into two phases. The first phase starts from 1971-1990, considered as Pre Liberalization Period and second phase is from 1991-2010, termed as Post Liberalization Period.

Sources of Data: The secondary data is taken as input to achieve the objectives of the present study. Data is collected specially from the reports on Direct Taxes compiled by the Comptroller and Auditor General of India of various years. A number of financial budgets and receipt documents on Direct Taxes of Ministry of Finance and Reserve Bank of India are also taken into account. Much documentary information is also bringing from the Directorate of Income Tax, India. Many Chartered Accountants journals, books and expert statements are used as per requirement of secondary data. The different ways and dimensions are also taken care in this respect.

Research Design: The study is analytical in nature, so for the present piece of work, descriptive research design was adopted. Personal Income Tax Revenue is Dependent variable and other tax reform variables are considered as Independent variable for secondary data.

Hypothesis: Two hypotheses are to be tested for analysis and which are as follows:

- H₀₀₁ There is no significant effect of personal income tax reforms on personal income tax revenue in pre liberalization period.
- H₀₀₂ There is no significant effect of personal income tax reforms on personal income tax revenue in post liberalization period.

Limitations: The present paper has its own limitations with regard to study area, data availability and other resources faced by a single researcher. Direct Tax is a wide area and tax reforms too, because it covers Personal and Corporate taxes. It is not possible to cover both types of reforms in a single paper because of many reasons like limited resources of one researcher and limited time etc. So, the paper is limited to Personal Income Tax Reforms only. Thus the insinuations of the results may not be sweeping away from such tax reforms.

Section III: Analysis and Discussion

Symbols are assigned to variables so that results and discussion may become simple and understandable, which are as follows:

Table 1 : List of Dependent and Independent Personal Income Tax Reform Variables Used in Multiple Linear Regression

S No.	Tax Reform Variables	Symbols
1	Personal Income Tax Revenue	PITR
2	Minimum Marginal Tax Rate	MTR _{min}
3	Maximum Marginal Tax Rate	MTR _{max}
4	Minimum Tax Slab	TS _{min}
5	Maximum Tax Slab	TS _{max}
6	Number of Assesseees	NOA
7	Cost of Collection	COC
8	Cost of Collection per Assessee	COCPA
9	Cost of Collection per Rupee	COCPR
10	Tax Ratio to Gross Domestic Product	Tax-GDP
11	Tax Buoyancy	TB

3.1 Effect of Personal Income Tax Reforms on Personal Income Tax Revenue in Pre and Post Liberalization Era

The current section is divided into two subsections which examines the effect of personal income tax reform variables on personal income tax revenue in pre and post liberalization era separately.

3.1.1 Effect of Personal Income Tax Reforms on Personal Income Tax Revenue in Pre Liberalization Era

The current section is going to analyze whether PITR is affected by personal income tax reform variables or not. Personal income tax reform variables are PITR, MTR_{min}, MTR_{max}, TS_{min}, TS_{max}, NOA, COC, COCPA, and COCPR, Tax-GDP ratio and TB. To analyze the effect of personal income tax reform variables on PITR, Enter method of Multiple Regression is used. The Enter Linear Regression Model of personal income tax reform variables are explained below for pre liberalization era:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \epsilon \text{-----} 1.1$$

Where Y = PITR which is a dependent variable, α is intercept, β₁ to β₁₀ are regression coefficients for personal income tax reform variables. X₁ = MTR_{min}, X₂ = MTR_{max}, X₃ = TS_{min}, X₄ = TS_{max}, X₅ = NOA, X₆ = COC, X₇ = COCPA, X₈ = COCPR, X₉ =

Tax-GDP, X₁₀ = TB. The error term Y represents the collective unobservable influence of any omitted variables.

Eq 1.1 is the original regression model but for normality of variables transformation is used. Natural log is applied for transformation. So, the researcher denote natural log of these variables by lower case.

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + \beta_{10} x_{10} + \epsilon \text{-----} 1.2$$

A change in (Δ) sign is applied with personal income tax reform variables, which show the natural log of these variables.

Now, in Eq. 1.2 y = ΔPITR which is a dependent variable, α is intercept, β₁ to β₁₀ are the regression coefficient for personal income tax reform variables. x₁ = ΔMTR_{min}, x₂ = ΔMTR_{max}, x₃ = ΔTS_{min}, x₄ = ΔTS_{max}, x₅ = ΔNOA, x₆ = ΔCOC, x₇ = ΔCOCPA, x₈ = ΔCOCPR, x₉ = ΔTax-GDP, x₁₀ = ΔTB. The error term Y represents the collective unobservable influence of any omitted variables. The final model is developed after meeting all assumptions of Multiple Linear Regression.

Table 1.1 showed the descriptive statistic of personal income tax reform variables in pre liberalization era. Descriptive statistic so presented in Table 1.1 is calculated using annual data of twenty years started from 1971 to 1990 regarding personal income tax reform variables. It can be seen from the Table that "PITR ranging from 6.28 to 8.59 with an average of 7.39. It means variability is high i.e. 0.66 with a low variance 0.44. Similarly, ΔMTR_{min}, ΔMTR_{max}, ΔTS_{min}, ΔTS_{max}, ΔNOA, ΔCOCPR, ΔTax-GDP and ΔTB also revealed a low variability with very low variance from 1971 to 1990. It can be considered that there are not many changes in these variables. But ΔCOC and ΔCOCPA discloses a towering variability from average as shown in Table 1.1. The Skewness and Kurtosis result leads to normality among personal income tax reform variables. In short, Skewness and Kurtosis show how the distribution of a variable deviates from a normal distribution.

Although Skewness and Kurtosis result leads to normality among personal income tax reform variables in descriptive statistic Table. Though, a normality test is compulsory for running a Multiple Regression to find out the effect of personal income tax reform variables on PITR. Normality of variables which are above 0.05 percent is said to be normal (Park, 2008). Shapiro-Wilk W statistic is applied for checking normality in the present study. Shapiro-Wilk W is the ratio of best estimator of the variance to the usually sum of square estimator of the variance. The statistic is positive and less than or equal to one. Being close to one indicates normality and in this study normality is checked at 0.01 or 0.05 percent level, as defined by Shapiro-Wilk (1965). Table 1.2 illustrates all study variables above 0.01 or 0.05 percent except ΔTS_{max}, so this variable is dropped from the Multiple Linear Regression model in pre liberalization era. Further, Multiple Linear Regression is run on rest of the personal income tax reform variables.

Table 1.1

Descriptive Statistics of Personal Income Tax Reform Variables in Pre Liberalization Era (1971-1990)

Variables	N Statistic	Minimum Statistic	Maximum Statistic	Mean Statistic	Std. Deviation Statistic	Variance Statistic	Skewness Statistic	Kurtosis Statistic
Δ PITR	20	6.28	8.59	7.39	0.66	0.44	0.32	-0.58
Δ MTR _{min}	20	2.30	3.40	2.83	0.34	0.11	-0.09	-0.68
Δ MTR _{max}	20	3.91	4.58	4.20	0.20	0.04	0.39	-0.46
Δ TS _{min}	20	8.52	10	9.32	0.50	0.25	-0.51	-1.22
Δ TS _{max}	20	11.16	13.82	12.72	1.17	1.37	-0.20	-1.96
Δ NOA	20	2.61	4.05	3.52	0.32	0.11	-0.72	2.14
Δ COC	20	2.90	5.19	4.03	0.72	0.52	0.11	-1.10
Δ COCPA	20	4.26	6.49	5.12	0.58	0.33	0.48	0.07
Δ COCPR	20	1.03	1.50	1.25	0.14	0.02	0.20	-1.05
Δ Tax-GDP	20	-0.18	0.45	0.09	0.16	0.03	0.32	0.29
Δ TB	20	-1.43	1.61	-0.08	0.72	0.52	0.47	0.54
Valid N (list-wise)	20							

Table 1.2: Shapiro-Wilk Test of Normality of Personal Income Tax Reform Variables in Pre Liberalization Era (1971-1990)

Variables	Statistic	df	p-value
Δ PITR	0.964	20	0.628
Δ MTR _{min}	0.924	20	0.119
Δ MTR _{max}	0.929	20	0.145
Δ TS _{min}	0.876	20	0.015
Δ TS _{max}	0.748	20	0.000
Δ NOA	0.908	20	0.059
Δ COC	0.953	20	0.420
Δ COCPA	0.962	20	0.584
Δ COCPR	0.957	20	0.481
Δ Tax-GDP	0.973	20	0.812
Δ TB	0.975	20	0.860

When, Enter Multiple Linear Regression is applied on rest of personal income tax reform variables in pre liberalization era. Then Coefficient of determination (R^2), Durbin-Watson (DW) test for autocorrelation and Variance Inflation Factor (VIF) is used for checking multicollinearity among study variables. R^2 is said to be good when it closed to one, DW ranges from zero to four and VIF is below ten (Christensen, 2011). VIF of Δ TS_{min}, Δ COC and Δ COCPA is above ten, it means problem of multicollinearity is present among these variables thus all these three variables are excluded from the Regression model. Finally, Regression is run on remaining personal income tax reform variables after meeting all assumptions of Multivariate Linear Regression in pre liberalization era. As a result, a final Linear Regression model is developed which is given below:

$$\Delta \text{PITR} = \alpha + \beta_1 \Delta \text{MTR}_{\text{min}} + \beta_2 \Delta \text{MTR}_{\text{max}} + \beta_3 \Delta \text{NOA} + \beta_4 \Delta \text{COCPR} + \beta_5 \Delta \text{Tax-GDP} + \beta_6 \Delta \text{TB} + \epsilon \text{-----} 1.3$$

Detailed discussion of eq. 4.3 is described with the help of tables given below. Table 4.3 explained the correlation between personal income tax reform variables. The following Table exposed a positive and strong correlation of "PITR along with Δ MTR_{min} and Δ NOA at 0.01 significance level. Whereas, there

is a negative correlation among Δ PITR and Δ MTR_{max}, Δ Tax-GDP at 0.01 or 0.1 confidence levels. But Table 4.3 show no correlation stuck between Δ PITR with Δ COCPR or Δ TB.

Eq. 1.3 is the final Multiple Linear Regression model of personal income tax reform variables in pre liberalization era and the summary of this model is demonstrated in Table 1.4. The coefficient of determination (R^2) is 0.94 and adjusted R^2 is 0.913 which is close to one. When R^2 is close to one it is an indication of the significantly high explanatory power of the model. In other words, it emerged significant independent personal income tax reform variables lead to more than 94 and 91 percent of variation in Δ PITR during pre liberalization era. F-ratio is 34.113 and p-value is below 5 percent significance level in the model as depicted in Table 1.4. F-ratio is significant at level through the study period. Though, F-ratio represents the ratio of the improvement in the prediction as the result fitting the model relative to the inaccuracy that still exists in the model. Durbin-Watson (DW) is the test used to examine the level of autocorrelation amid variables. As a conservative rule-I suggested that DW test value less than 1 or greater than 3 should definitely raise alarm bells (Field, 2003). However, there seems to be no problem of autocorrelation along with variables, because DW value is 2.125 in pre liberalization era. Hence, the results of the model give reliable estimates.

Table 1.5 confirms p-value below 0.05 level depicts significant result. Though, ANOVA Table shows a significant Regression model but failed to accept studies first null hypothesis (H_{001}).

H_{001} is that there is no significant effect of personal income tax reforms on personal income tax revenue in pre liberalization era. ANOVA Table rejects the H_{001} . Now, it can be concluded that personal income tax reform variables have a significant effect on personal income tax revenue in pre liberalization era. Table 1.6 reveals detail of independent personal income tax reform variables i.e. Δ MTR_{min}, Δ MTR_{max}, Δ NOA, Δ COCPR, Δ Tax-GDP, Δ TB. Variance Inflation Factor (VIF) is exercised to remove multicollinearity. Cut-off point of 5 and 10 are

Table 1.3: Karl Pearson Coefficient of Correlation among Personal Income Tax Reform Variables in Pre Liberalization Era (1971-1990)

Variables	Karl Pearson Correlation	Δ PITR	Δ MTR _{min}	Δ MTR _{max}	Δ NOA	Δ COCPR	Δ Tax-GDP	Δ TB
Δ PITR	r	1						
	p-value (2-tailed)							
	N	20						
Δ MTR _{min}	r	.657***	1					
	p-value (2-tailed)	.002						
	N	20	20					
Δ MTR _{max}	r	-.897***	-.724***	1				
	p-value (2-tailed)	.000	.000					
	N	20	20	20				
Δ NOA	r	.620***	.391*	-.408*	1			
	p value (2-tailed)	.004	.088	.074				
	N	20	20	20	20			
Δ COCPR	r	.331	.609***	-.494**	.288	1		
	p-value (2-tailed)	.153	.004	.027	.218			
	N	20	20	20	20	20		
Δ Tax-GDP	r	-.379*	-.706***	.440*	-.231	-.824***	1	
	p-value (2-tailed)	.100	.000	.052	.326	.000		
	N	20	20	20	20	20	20	
Δ TB	r	-.162	-.248	.215	-.242	-.350	.460**	1
	p-value (2-tailed)	.494	.292	.363	.304	.130	.041	
	N	20	20	20	20	20	20	20

*** Correlation is significant at 0.01 level (2-tailed).

** Correlation is significant at 0.05 level (2-tailed).

* Correlation is significant at 0.1 level (2-tailed).

Table 1.4: Model Summary^b of Personal Income Tax Reform Variables in Pre Liberalization Era (1971-1990)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				DW	
					R Square Change	F	df1	df2		p-value
1	.970 ^a	.940	.913	.19551	.940	34.113	6	13	.000	2.125

a. Predictors: (Constant), Δ MTR_{min}, Δ MTR_{max}, Δ NOA, Δ COCPR, Δ Tax-GDP, Δ TB.

b. Dependent Variable: Δ PITR.

Table 1.5: ANOVA^b of Personal Income Tax Reform Variables in Pre Liberalization Era (1971-1990)

Model		Sum of Squares	df	Mean Square	F	p-value
1	Regression	7.824	6	1.304	34.113	.000 ^a
	Residual	.497	13	.038		
	Total	8.321	19			

a. Predictors: (Constant), Δ MTR_{min}, Δ MTR_{max}, Δ NOA, Δ COCPR, Δ Tax-GDP, Δ TB.

b. Dependent Variable: Δ PITR.

recommended as a rule of thumb for VIF to detect moderate and severe multicollinearity problem among variables (Bagheri and Midi, 2009).

As the results shown in Table 1.6, following interesting findings are immersed in pre liberalization era:

First, p-value of Δ MTR_{min} is not significant at 1 or 5 percent confidence level. It means Δ MTR_{min} i.e. Minimum Marginal Tax Rates has accepted a part of H_{001} that means minimum marginal tax rates has no effect on Δ PITR. Thoresen and Aarbu

(1999) conducted the same type of study, also used Regression and found that marginal tax rates do neither have a strong or unambiguous effect on income growth. Arnold (2008) observed a negative relationship between the progressivity of personal income taxes and growth. In support to current model result Gagne (2001) explained that marginal tax rates only affect the high income taxpayers, which generate tax revenue but low income taxpayers failed to raise tax revenue. Kiss (2011) examined that lower bound on tax rates i.e. minimum marginal tax rates put a ceiling on countries to punish deviators.

Table 1.6: Regression Coefficients^a Personal Income Tax Reform Variables in Pre Liberalization Era (1971-1990)

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value	Correlations			Collinearity Statistics			
	B	Std. Error				Beta	Zero-order	Partial	Part	Tolerance	VIF	
1	(Constant)	20.513	2.378		8.627	.000						
	ΔMTR_{min}	-.251	.260	-.127	-.966	.352	.657	-.259	-.065	.264	3.789	
	ΔMTR_{max}	-2.945	.343	-.904	-8.583	.000	-.897	-.922	-.582	.414	2.417	
	ΔNOA	.735	.158	.361	4.666	.000	.620	.791	.316	.768	1.302	
	$\Delta COCPR$	-1.989	.602	-.419	-3.306	.006	.331	-.676	-.224	.286	3.492	
	$\Delta Tax-GDP$	-1.603	.637	-.387	-2.515	.026	-.379	-.572	-.170	.194	5.154	
	ΔTB	.109	.073	.119	1.497	.158	-.162	.384	.101	.726	1.377	

a. Dependent Variable: $\Delta PITR$.

The implication of minimum marginal tax rates may thus harm all countries and restrict welfare.

Beta value (β_2) of ΔMTR_{max} turns out to be negative at 1 percent level of significance. It can be wrapped up with the results that ΔMTR_{max} i.e. Maximum Marginal Tax Rates have a brawny but negative relation with $\Delta PITR$. It means when ΔMTR_{max} increases then $\Delta PITR$ decreases or vice-versa. In prop up to this outcome, there are several studies like Feldstein (1995), Hansson (2004) Holmund & Soderstrom (2007, 2008), they applied a panel data study and illustrated that reduction in marginal tax rates have negligible effect on tax revenue or in long-run resulted in fiscal surplus. Piketty and Saez (2007) showed opposite results from this view that a reduction in top marginal tax rates produces less revenue from top income group. Because, top 1 percent of earners paid over 70 percent of their income in federal taxes in 1960, while top 1 percent of earners paid only about 35 percent of their income in 2005.

ΔNOA exhibits significant positive affiliation with $\Delta PITR$. The result shows that ΔNOA i.e. Number of Assesseees has a momentous affect on personal income tax revenue in Pre Liberalization Era. Chattopadhyay and Das-Gupta (2002) too found that an increased number of taxpayers resulted in high tax revenue. $\Delta COCPR$ and $\Delta Tax-GDP$ both have demonstrate sturdy negative association in the midst of $\Delta PITR$ at 1 or 5 percent confidence level. Nawaz (2010) explored a interesting outcome that tax-GDP increases tax revenue but corruption too. On the other hand, Corruption not only lowers the tax-GDP ratio but also causes long-term damage to the economy by detracting investment, increasing the size of the informal economy, distorting tax structures and corroding the tax morality of taxpayers. All of these in turn further reduce the long term revenue generating potential of the economy. Palande (2011) examined that low tax rates brought down tax-GDP ratio during 1990's and ultimately harms economy growth. Widening the tax base only can solve this problem. Table 1.6 discloses that ΔTB has no significant effect on $\Delta PITR$. ΔTB i.e. Tax Buoyancy has no effect on personal income tax revenue in pre liberalization era. Ahmed and Mohammed (2010) organised an opposite study. They examined the impact of tax buoyancy on tax collection and found increase monetary

growth also persuade positively on tax collection because rise in monetization cause documentation of transaction which improves tax buoyancy.

3.1.2 Effect of Personal Income Tax Reforms on Personal Income Tax Revenue in Post Liberalization Era:

Descriptive statistic of personal income tax reform variables in post liberalization era are shown in Table 1.7. Descriptive statistic so presented in Table 1.7 is calculated with the help of twenty years records started from 1991 to 2010 regarding personal income tax reform variables. Table 1.7 divulges that $\Delta PITR$ ranging from 8.81 to 11.74 with an average of 10.35. It means variability is very high i.e. 0.92 with a high variance 0.85. Similarly, ΔMTR_{min} , ΔMTR_{max} , ΔTS_{max} , $\Delta COCPR$ and $\Delta Tax-GDP$ also revealed a low variability with very low variance during study time period. It can be considered that there are not many changes in these variables. But ΔTS_{min} , ΔNOA , ΔCOC , $\Delta COCPA$ and ΔTB unveil a towering variability from average as shown in Table 1.7. The Skewness and Kurtosis show how the distribution of variables deviates from a normal distribution.

A normality test is required for running a Multiple Regression to locate the effect of personal income tax reform variables on $\Delta PITR$. Normality of variables is checked at 0.01 or 0.05 percent level in the present study as applied by Nachegea and Fontaine (2006). Table 1.8 points up all study variables above 0.01 or 0.05 percent except three variables, which are ΔMTR_{min} , ΔMTR_{max} and $\Delta COCPA$ so these variables are dropped from the Linear Regression model in post liberalization era. Further, Linear Regression is run on rest of the personal income tax reform variables.

Enter Linear Regression is used on rest of personal income tax reform variables in post liberalization era. After that Coefficient of determination (R^2), Durbin -Watson (DW) test for autocorrelation and Variance Inflation Factor (VIF) is used for checking multicollinearity among study variables. ΔCOC -have the problem of multicollinearity with other variables thus this variable is debarred from the regression model. Finally, regression is run on remaining personal income tax reform variables after meeting all assumptions of Multivariate Linear

Table 1.7: Descriptive Statistics of Personal Income Tax Reform Variables in Post Liberalization Era (1991-2010)

Variables	N Statistic	Minimum Statistic	Maximum Statistic	Mean Statistic	Std. Deviation Statistic	Variance Statistic	Skewness Statistic	Kurtosis Statistic
"PITR ⁱ	20	8.81	11.74	10.35	0.92	0.85	-0.01	-1.05
"MTR _{min} ⁱ	20	2.3	3	2.50	0.31	0.10	1.05	-0.91
"MTR _{max} ⁱ	20	3.4	4.03	3.57	0.16	0.03	1.48	2.02
"TS _{min} ⁱ	20	10	11.98	10.97	0.58	0.33	0.31	-0.98
"TS _{max} ⁱ	20	13.12	14.22	13.88	0.27	0.08	-0.79	1.65
"NOA ⁱ	20	4.34	5.93	5.27	0.53	0.29	-0.46	-1.47
"COC ⁱ	20	5.45	8.42	6.69	0.77	0.60	0.41	0.16
"COCPA ⁱ	20	17.3	36.69	20.78	4.79	22.93	2.48	6.36
"COCPR ⁱ	20	0.27	1.33	0.94	0.31	0.10	-0.72	-0.02
"Tax-GDP ⁱ	20	0.03	0.78	0.36	0.22	0.05	0.19	-0.97
"TB ⁱ	20	-1.42	0.96	0.26	0.62	0.39	-1.11	1.17
Valid N (list-wise)	20							

* Note: *i* = Post Liberalization Period.

Table 1.8: Shapiro-Wilk Test of Normality of Personal Income Tax Reform Variables in Post Liberalization Era (1991-2010)

Variables	Statistic	df	p-value
"PITR ⁱ	0.956	20	0.470
"MTR _{min} ⁱ	0.599	20	0.000
"MTR _{max} ⁱ	0.807	20	0.001
"TS _{min} ⁱ	0.923	20	0.112
"TS _{max} ⁱ	0.874	20	0.014
"NOA ⁱ	0.874	20	0.014
"COC ⁱ	0.954	20	0.439
"COCPA ⁱ	0.667	20	0.000
"COCPR ⁱ	0.925	20	0.121
"Tax-GDP ⁱ	0.951	20	0.379
"TB ⁱ	0.90236	20	0.046

Regression in post liberalization era. As a result, a final Linear Regression model is developed which is given below:

$$\Delta \text{PITR}^i = \alpha + \beta_1 \Delta \text{TS}_{\min}^i + \beta_2 \Delta \text{TS}_{\max}^i + \beta_3 \Delta \text{NOA}^i + \beta_4 \Delta \text{COCPR}^i + \beta_5 \Delta \text{Tax-GDP}^i + \beta_6 \Delta \text{TB}^i + \varepsilon \quad \text{--- 1.4}$$

Where *i* = Post Liberalization Period and other definition of variables is same as explained earlier. Detailed discussion of Eq. 1.4 is described with the help of tables given below. Table 4.9 elucidate the correlation between personal income tax reform variables in post liberalization era. The following Table exposed a positive and strong correlation of ΔPITR^i along with $\Delta \text{TS}_{\min}^i$, ΔNOA^i and $\Delta \text{Tax-GDP}^i$ - at 1 percent significance level. Whereas, a negative correlation among ΔPITR^i and ΔCOCPR^i - at 1 percent confidence level. But Table 4.9 show no correlation stuck between ΔPITR^i with ΔTB^i .

The summary of final Multiple Linear Regression model of personal income tax reform variables in post liberalization era-is demonstrated in Table 1.10. The coefficient of determination (R^2) is 0.993 and adjusted R^2 is 0.99 which is close to one. When R^2 is close to one it is an indication of the significantly high explanatory power of the model. In other words, it emerged significant independent personal income tax reform

variables lead to more than 99 and 99 percent of variation in ΔPITR^i during post liberalization era. F-ratio is significant at 5 percent confidence level through the study period. Though, F-ratio represents the ratio of the improvement in the prediction as the result fitting the model relative to the inaccuracy that still exists in the model. There seems to be no problem of autocorrelation between variables, because DW value is 2.135 in Post Liberalization Era. DW ranges from zero to four for checking autocorrelation and DW test value closed to 2 appear as good (Christensen, 2011). Hence, the results of the model give reliable estimates in post liberalization era.

ANOVA Table publicized above reveals significant results and rejects the second part of H_{001} , H_{001} is that there is no significant effect of personal income tax reforms on personal income tax revenue in pre and post liberalization era. ANOVA Table rejects the second part of H_{001} . Now, it can be said that personal income tax reform variables have a significant effect on personal income tax revenue in post liberalization era. Table 4.12 reveals detail of independent personal income tax reform variables i.e. $\Delta \text{TS}_{\min}^i$, $\Delta \text{TS}_{\max}^i$, ΔNOA^i , ΔCOCPR^i , $\Delta \text{Tax-GDP}^i$, ΔTB^i . VIF value of $\Delta \text{Tax-GDP}^i$ is above 10 but below 15, this is not an indication of multicollinearity because VIF below 15 or 17 is acceptable (Hollander, 2011). Other independent variables have VIF value below 10.

Table 1.12 is evidence for a brawny affirmative relationship in the midst of $\Delta \text{TS}_{\min}^i$ and ΔPITR^i . Thus, it can be plunged that minimum tax slab have an impact on personal income tax revenue. Bhalla (2004) observed that tax cuts increases tax compliance and tax compliance doesn't vary equal in all tax slabs. Minimum tax slab includes maximum number of taxpayer which increases ultimate tax revenue. $\Delta \text{TS}_{\max}^i$ shows no significant effect on ΔPITR^i , while ΔNOA^i exhibits noteworthy positive affiliation with ΔPITR^i as per Table 1.12. The result shows that ΔNOA^i i.e. Number of Assesseees has a momentous affect on personal income tax revenue. ΔCOCPR^i reveals no significant effect on ΔPITR^i and influence to accept the other part of H_{001} that one of the personal income tax reform variables

Table 1.9: Karl Pearson Coefficient of Personal Income Tax Reform Variables in Post Liberalization Era (1991-2010)

Variables	Karl Pearson Correlation	$\Delta P I T R^i$	$\Delta T S_{min}^i$	$\Delta T S_{max}^i$	$\Delta N O A^i$	$\Delta C O C P R^i$	$\Delta T a x - G D P^i$	$\Delta T B^i$
$\Delta P I T R^i$	r	1						
	p-value (2-tailed)							
	N	20						
$\Delta T S_{min}^i$	r	.965***	1					
	p-value (2-tailed)	.000						
	N	20	20					
$\Delta T S_{max}^i$	r	-.430*	-.481**	1				
	p-value (2-tailed)	.059	.032					
	N	20	20	20				
$\Delta N O A^i$	r	.950***	.883***	-.386*	1			
	p-value (2-tailed)	.000	.000	.092				
	N	20	20	20	20			
$\Delta C O C P R^i$	r	-.600***	-.542**	.159	-.550**	1		
	p-value (2-tailed)	.005	.014	.504	.012			
	N	20	20	20	20	20		
$\Delta T a x - G D P^i$	r	.964***	.915***	-.450**	.890***	-.720***	1	
	p-value (2-tailed)	.000	.000	.046	.000	.000		
	N	20	20	20	20	20	20	
$\Delta T B^i$	r	-.031	-.049	-.019	-.004	-.312	.031	1
	p-value (2-tailed)	.897	.838	.937	.987	.180	.897	
	N	20	20	20	20	20	20	20

*** Correlation is significant at 0.01 level (2-tailed).

** Correlation is significant at 0.05 level (2-tailed).

* Correlation is significant at 0.1 level (2-tailed).

Table 1.10: Model Summary^b of Personal Income Tax Reform Variables in Post Liberalization Era (1991-2010)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change R Square	Change Statistics			Durbin-Watson	
						F	df1	df2		
1	.996 ^a	.993	.990	.09422	.993	301.002	6	13	.000	2.135

a. Predictors: (Constant), $\Delta T S_{max}^i$, $\Delta T S_{min}^i$, $\Delta N O A^i$, $\Delta C O C P R^i$, $\Delta T a x - G D P^i$, $\Delta T B^i$.

b. Dependent Variable: $\Delta P I T R^i$.

Table 1.11: ANOVA^b of Personal Income Tax Reform Variables in Post Liberalization Era (1991-2010)

Model	Sum of Squares	df	Mean Square	F	p-value
1	Regression	16.032	6	2.672	301.002
	Residual	.115	13	.009	
	Total	16.147	19		

a. Predictors: (Constant), $\Delta T S_{max}^i$, $\Delta T S_{min}^i$, $\Delta N O A^i$, $\Delta C O C P R^i$, $\Delta T a x - G D P^i$, $\Delta T B^i$.

b. Dependent Variable: $\Delta P I T R^i$.

Table 1.12: Regression Coefficients^a of Personal Income Tax Reform Variables in Post Liberalization Era (1991-2010)

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value	Correlations			Collinearity Statistics		
	B	Std. Error				Zero-order	Partial	Part	Tolerance	VIF	
			Beta								
1	(Constant)	-1.568	1.756		-.893	.388					
	$\Delta T S_{min}^i$	.575	.108	.360	5.336	.000	.965	.829	.125	.121	8.296
	$\Delta T S_{max}^i$	.152	.094	.045	1.613	.131	-.430	.408	.038	.700	1.429
	$\Delta N O A^i$	.507	.098	.294	5.149	.000	.950	.819	.121	.169	5.931
	$\Delta C O C P R^i$	.193	.125	.065	1.543	.147	-.600	.393	.036	.306	3.272
	$\Delta T a x - G D P^i$	1.813	.366	.440	4.949	.000	.964	.808	.116	.070	14.376
	$\Delta T B^i$	-.007	.039	-.005	-1.77	.863	-.031	-.049	-.004	.802	1.247

a. Dependent Variable: $\Delta P I T R^i$

has no significant affect on personal income tax revenue. Δ Tax-GDP demonstrates strapping positive alliance in the midst of Δ PITR at 1 or 5 percent confidence level. Cok et. al. (2011) explored a fascinating outcome that reforms on personal income tax reduces the tax burden of tax payers and lessening tax rates lessen government revenue also produce low GDP. Table 1.12 discloses that Δ TB has insignificant effect on Δ PITR. Δ TB i.e. Tax Buoyancy has no effect on personal income tax revenue in post liberalization era. But Gupta (2009) assessed that tax ratio and tax measures fail to specify the responsiveness of tax structure to changes in state's income over time. Thus, the temporal analysis of tax responsiveness in terms of buoyancy of taxation has effectiveness of a tax system.

3.1.3 Comparative Panorama of Effect of Personal Income Tax Reform Variables on Personal Income Tax Revenue in Pre and Post Liberalization Era:

The comparison between effects of personal income tax reform variables on personal income tax revenue in pre and post liberalized era explained above, one can say from above analysis that Δ MTR_{min} has no impact on personal income tax revenue but Δ MTR_{max} effects Δ PITR. Poulson and Kalpan (2008) exposed significant negative impact of higher marginal tax rates on income tax and economic growth. Meade (1995) scrutinized that an income tax regime dejects proportional savings & promote risk taking and affect tax revenue, when future marginal tax rates are certain. As per the results of present study marginal tax rates has no relation with personal income tax revenue in post liberalization period. One of the reasons is that marginal tax rates are little bit static since 1991. Marginal tax rates affect tax revenue in pre liberalization period because of progressivity in tax rates. High tax rates produce less revenue and low economic growth or *vice-versa*, as explained by Laffer (2004). Neither minimum tax slab nor maximum tax slab has its effect on tax revenue in pre reform time because tax slab has a narrow base at that time. Though, in post reform times minimum tax slab get success in raising personal income tax revenue, but maximum tax slab proves failed in this trail. Increasing in number of assesseees and tax-GDP has an influence on personal income tax revenue both in pre and post liberalization era. Ahmed and Hyder found that income tax in the decade of 1980's when GDP growth was high; consequently the natural growth in tax collection was high. Δ COC is not including in personal income tax reform variables both in pre and post liberalization phase, just a reason of multicollinearity with other reform variables. But it doesn't mean that cost of collection has no affect on personal income tax revenue. Yesin (2004) and Mitchell (2005) explored in their studies that government cost of collection on taxes is high then government increases tax rates for lofty tax collection and resulted in less payment of taxes by taxpayers, which reduces tax revenue and economic growth. Tax buoyancy reveals an insignificant effect on personal income tax revenue equally in pre and post liberalization epoch. Chipeta (1998) analysed that the introduction of new taxes are not sufficient for raising buoyancy in tax system.

Ultimately, the significant result of analysis rejects the H_{001} & H_{002} and immersed that overall personal income tax reform variables have a sturdy effect on Personal income tax revenue in mutually pre and post liberalization era in the current study, same outcome was also produced by Tanzi and Shome (1992). This can accomplish all the objectives of this study.

SECTION IV: CONCLUSION AND FINDINGS

The paper concludes that in pre liberalization era, minimum marginal tax rates has no impact on personal income tax revenue but maximum marginal tax rates effects tax revenue. As per the results of present study marginal tax rates has no relation with personal income tax revenue in post liberalization period. One of the reasons is that marginal tax rates are little bit static since 1991. Marginal tax rates affect tax revenue in pre liberalization period because of progressivity in tax rates. High tax rates produce less revenue and low economic growth or *vice-versa*, as explained by Laffer (2004). Increasing in number of assesseees and tax-GDP has an influence on personal income tax revenue both in pre and post liberalization era. Cost of collection is excluding in personal income tax reform variables both in pre and post liberalization phase, just a reason of multicollinearity with other reform variables. Tax buoyancy reveals an insignificant effect on personal income tax revenue equally in pre and post liberalization epoch. Though, significant analysis results rejects H_{001} and concludes that overall personal income tax reform variables have a sturdy effect on personal income tax revenue in mutually pre and post liberalization era in the current study. These results can help in achievement of objectives of present study.

SECTION V: POLICY IMPLICATION

The paper can help to promote administrative, managerial and financial support to personal income tax reforms and raises personal income tax revenue in India. The paper also suggests that Government of India should have to widen the minimum income tax slabs for covering a large portion of Indian population which reduces cost of collection and resulted in high tax-GDP ratio in India. But still the paper has limited area of implications.

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