STUDY REPORT ON

Estimating True Fiscal Capacity of States and Devising a Suitable Rule for Granting Debt Relief based on Optimal Growth Requirement

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PREFACE

The above study was sponsored by 14th Finance Commission as a background study. The motivation of the present study was mainly two fold- one is to estimate a rational tax base for the states and then calculate the 'true' tax effort of the states. The second is the problem of deficit and debt which plague all the states at different degrees of intensity. Every finance commission is besieged with the problem and wants to address the issue, it appears to us one needs a theoretical basis to restructure the devolution principle. This could then be related to the debt restructuring issue.

The present study has made a pilot effort to do the above for 17 non-special category states. The choice of the states is driven by the fact that the theoretical underpinnings presented here is most suitable for non-special category states. However, the exercise could be extended to special category states also, although the end results may give some high value figures. Further, the tax effort is linked here to fiscal discipline issue so that the two criteria used for devolution in the thirteenth finance commission report, namely fiscal capacity distance and fiscal indiscipline may be viewed together in an integrated fashion. In fact we have argued that the two should not be independent occurrences.

We are really thankful to fourteenth Finance Commission for agreeing to sponsor the study. The main problem we faced is the time given for completion of the study. The paucity of sub-national level data and standardizing the data across states posed big challenges and we have tried our best to face this. We intend to pursue this and extend it to special category states with suitable modifications if required.

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1. Introduction

Fiscal Capacity of a nation is estimated by its tax to GDP ratio. However, for a country, fiscal capacity at sub-national levels pose challenges since many data which are published for the national level are not available for the sub-national levels. In India, state's own fiscal capacity is a sub-national category and is usually measured in terms of ex post tax collection performance. The term own fiscal capacity is important since truly speaking it excludes tax shares and grants from central government as well as market borrowing and other loans. The basic difference of special and non-special category states is in terms of low fiscal capacity of the special category states and this is largely influenced by geographical locations of the states. These states are mainly in the North-east as well as hilly states like Jammu and Kashmir and Himachal Pradesh. This criterion is pursued for quite some time now and needs some introspection.

It is well known that tax is collected by states mainly from organized (or formal) manufacturing sector and construction as well as organized services. The VAT also includes sales of wholesalers and retailers, of which retailers again are mostly unregistered. The tax on construction is realized primarily not through VAT but through stamp duties at the time of registration of the property, since the rate of stamp duty is higher. The tax collected on organized manufacturing and trade in the form of VAT stays with the state whereas that on services is centrally collected. This will change when GST comes into force. Thus states with very high percentage of manufacturing and services concentrated in the unorganized sector have a large proportion of economic activity which is conventionally non-taxed. This naturally reduces their taxable capacity, thus affecting its fiscal capacity when measured in terms of ex post tax collection figures expressed as a percentage of GSDP. Since finance commission does not distinguish between organized and unorganized sectors while calculating fiscal capacity, this under-estimates the tax efforts of states having a high share of unorganized manufacturing.

The last finance commission report has raised the following issue regarding resource sharing rules between centre and the states- "Recent Finance Commissions have used equity and efficiency as the two guiding principles while recommending inter se shares of states in tax devolution. The principle of equity addresses the problem of differences in revenue raising capacity and cost disabilities across states. When capacity is assessed on the basis of observed revenue collected there is the risk of moral hazard in making the states lax in terms of improving their revenue effort and managing their finances prudently. The principle of efficiency is intended to address this issue and to motivate the states to exploit their resource base and manage their fiscal operations in a cost effective manner. A

combination of these two principles has found wide acceptability and addressed the concerns of reforming states. Our recommendations on horizontal sharing have been informed by these principles (Report of 13th Finance Commission, Government of India, New Delhi, Ch 8, Section 9.76, PP 118)

2. The Concepts of Taxable Capacity and Tax Effort

The actual tax to GDP or GSDP (in case of sub-national levels for India) collection ratio is usually interpreted as a measure of tax effort and used as the basis for cross country tax comparison. The use of such ratio is meaningful if one attempts to establish trends or to compare tax revenue performance across economies with similar structure and at comparable levels of income. Thus if one wants to have a comparative picture for states in India, it would make sense to divide the states into non-special category or special category. As Min Le et al (2008) commented- "However, when used to compare the effectiveness in revenue mobilization across countries in different income groups, the tax-GDP ratio could provide a "completely distorted" picture due to different economic structures, institutional arrangements, and demographic trends….. In essence, this ratio does not reflect the tax capacity of a country and hence it is impossible to assess whether or not a country is out of line in comparison with its peers in its effort to raise domestic tax revenues……A number of tax economists have attempted to deal with this problem by applying an empirical approach to estimate the determinants of tax collection and identify the impact of such variables on each country's taxable capacity. *Taxable capacity* is the predicted tax- GDP ratio estimated from a regression, taking into account the country's specific characteristics. *Tax effort* is the index of the ratio between the share of the actual collection to GDP and the predicted taxable capacity. A tax effort of above 1 (high tax effort) implies that the country utilizes well its tax base to increase revenues. On the other hand, a country with the tax effort below 1 (low tax effort) is likely to have relatively substantial scope or potential to raise revenues (pp. 5-6)."

One challenging task is to determine tax potential of a region at national and sub-national levels. The standard approach is to run regressions of tax ratio on some variables. The main problem is to collect data at sub-national levels on variables which are available at national level. Let us take the following example from Minh Le et al (2008) mentioned above. In order to calculate taxable capacity which is nothing but the taxation potential of the region, the authors have assumed the following regression equation for the national level.

The basic specification is:

Y = f (GDP, POP, TRADE, AGR, CORR, BUREAU)

Where,

Y : Tax (including social contributions) or total fiscal revenue ratio to GDP.

GDP : GDP per capita (constant 2000 $US).

POP : Rate of population growth or age dependency ratio as a share of the total population.

TRADE : Trade openness (measured as ratio of exports plus imports of goods and services to GDP).

AGR : Agricultural value added.

CORR : Corruption index.

BUREAU : Bureaucracy quality.

Let us quote from the article of Minh Le (2008)- "The underlying hypothesis of the specification is that the tax or fiscal revenue capacity of a country is determined not only by economic factors but also by key demographic and institutional characteristics. In particular, high corruption, high population growth rates, and high age dependency ratios tend to depress the taxable capacity of a country, other things being equal. Agriculture is one typical hard-to-tax sector; most developing countries exempt from taxes a large share of agricultural activities due to its inherent difficulty to collect the tax or due to equity and political reasons. Thus a higher level of agricultural value added is expected to correlate with a lower level of taxable capacity (p.7)."

This highlights the problem of extending such a methodology to sub-national levels. In case of India, data on corruption index, bureaucracy quality or trade openness are simply not available for all states and over time. Thus one may not be able to capture all the variables which influence the extent of taxable capacity separately. As a result many of these efficiency related variables are captured in the state specific constant term when a fixed effect panel data regression is run over the states. The upshot of the story is that policies to enhance efficiency could not be framed very specifically, although some idea of the magnitude of the aggregate inefficiency may be formed from the fixed effect values.

Following Jenkins, Kuo and Shukla (2000) –"the total tax revenue of the government will invariably depend upon the size of the tax base, the levels of tax rates adopted within the tax system, administrative efficiency, and the compliance rate. The taxes introduced should be appropriate and sufficient to finance the expenditure needs of the government over time. In other words, revenues

should rise with national income, and the entire tax system should evolve to enhance the revenue yield over time (p.117)". The authors have mentioned the various aspects of VAT and problems encountered for enhancing revenues from VAT. In India, VAT is the main source of revenue for states and they are imposed by the state governments and not by the central governments.

Jenkins et al (2000) have following comment on VAT which is worth pursuing – "The potential tax revenue of a VAT depends very much upon the scope of the tax base, the tax rate, and the general level of tax compliance. The tax base is determined by the extent to which goods and services are covered under the VAT. Besides the tax base, the complexity of the tax system and the effectiveness of the tax administration can also influence the degree of compliance. As the size of the tax base is dependent upon the scope of the sector or goods and services included in the tax system, the VAT system is generally loaded with tax exemptions and zero-rated goods and services that affect the tax base. These measures arise because of various political and socio-economic considerations, administrative reasons, and technical obstacles. The level at which tax exemptions are given and the number of goods and services that are zero-rated determine the scope of the tax base. However, with the enactment of these two categories at different levels of the production and distribution chain, the revenue implications are quite different (pp. 118-119)".

While the above comments apply in Indian case as well for sub-national governments, the problem is compounded by the presence of unorganized sector in manufacturing and trade. This sector escapes VAT since the chain needed to calculate VAT in each stage is more or less absent in these activities. Although a segment of this sector could well pay taxes (namely DME or NDME enterprises labeled as establishments by National Sample Survey organization who are largely responsible for collecting data on this sector), this is roughly around 20 to 25 per cent of total value added in this sector. Further, even this segment may not pay its due taxes for lack of compliance as mentioned by Jenkins et al (2000).

2.1 Estimated Tax Potential of States

Following traditional practice, an effort is made to calculate tax potential of states. To note, this tax is state's own tax revenue, which is driven by VAT. The steps are described as below.

First, Registered manufacturing value added is calculated from National Accounts statistics
Second, Unregistered trade value added is collected from 2010-11 National Sample Survey on Unregistered manufacturing and trade. The percentage of this to total trade value added as given in

National Accounts statistics for 2010-11 is calculated (In National Accounts Statistics, the term is Trade, Hotels and Restaurants, whereas, in National Sample Survey study on unorganized trade it is only trade). Assuming this percentage (as given in table 1 below) is unchanged for the period 2004-05 to 2011-12, we have calculated unregistered value added for each state during this period. The reason for adopting this method is unavailability of a combined survey on unorganized Manufacturing and Trade simultaneously by NSSO any year before 2010-11. Apart from this reason for not shifting the time period for regression too far backwards and fixed at 2004-05 which is the newest base year for GSDP and price indices in India. This avoids compatibility of index numbers issues.

Third, The Tax base of a state is given by addition of Registered Manufacturing plus registered trade plus construction.

Fourth, A panel fixed effect regression is run for two groups of states, namely non-special (NS) category and special category states. In NS states, Delhi NCR is not taken for lack of compatible data for the entire period under study (keeping in mind our calculations done in the next section on debt restructuring etc). So altogether in NS, there are 17 states as given in Table 1 below.

Table 1: Unregistered Trade percentage to total trade value added (NS states) in 2010-11

	Unregistered ratio in Trade (2010-11)
Andhra Pradesh	0.278077
Bihar	0.177548
Chattisgarh	0.308313
Goa	0.062684
Gujarat	0.143092
Haryana	0.138892
Jharkhand	0.224278
Karnataka	0.257067
Kerala	0.268751
Madhya Pradesh	0.304578
Maharashtra	0.187091
Odisha	0.23654
Punjab	0.31019
Rajasthan	0.183153
Tamil Nadu	0.215792
Uttar Pradesh	0.346552
West Bengal	0.25718

Source: NSS 67th round, Key results of Survey for unincorporated Non-agricultural Enterprises (Excluding Construction) in India, 2012

In table 2 below, figures are given for NS states about tax base as percentage of GSDP for three years average for years 2005 to 2008 and 2009 to 2012. This data is collected from NAS except the adjustment for trade as mentioned above. For comparison purposes, the share of unregistered manufacturing plus trade for 2010-11 as revealed in NSS survey in 2010-11 is given.

Table 2: Tax base data from NAS (Registered Manufacturing and trade plus construction)

States	Tax Base to GSDP Ratio (Percent)
Andhra pradesh	28.4286
	26.5679
Bihar	27.47427
	31.80943
Chhattisgarh	34.52203
	29.3727
Goa	42.93173
	34.5438
Gujarat	44.7621
	45.1557
Haryana	37.97493
	39.57883
Jharkhand	37.21327
	38.74303
Karnataka	34.94997
	31.9243
Kerala	31.07933
	31.45613
Madhya pradesh	27.72503
	27.4943
Maharastra	36.108
	32.551
Odisha	31.13763
	29.5628
Punjab	25.63427
	25.10393
Rajasthan	31.86643
	31.07807
Tamil Nadu	36.47867
	38.60627
Uttar Pradesh	25.01903
	23.88893
West Bengal	24.695
	23.49277

Note: In column 2, the first figure is average for 2006-07 to 2008-09 and the second is the average for 2009-10 to 2011-12

Source: National Accounts Statistics (2004-05 Base), CSO

Table 3: Unregistered Sector data (Manufacturing plus trade) from NSS Survey, 2010-11 and comparison with ASI data (Manufacturing only), 2010-11 for organized manufacturing sector

States	Unregsitered sector ratio to GSDP	Organised Manufacturing ASI data as a ratio to Unregistered sector
Andhra pradesh	0.0623	1.8680
Bihar	0.0482	0.4611
Chattisgarh	0.0463	2.8402
Goa	0.0207	8.8257
Gujarat	0.0626	3.4104
Haryana	0.0504	2.2508
Jharkhand	0.0428	4.9473
Karnataka	0.0682	1.7720
Kerala	0.1027	0.3531
Madhya Pradesh	0.0590	1.3231
Maharashtra	0.0561	2.9168
Odisha	0.0431	2.5487
Punjab	0.0670	1.5163
Rajasthan	0.0488	1.3834
Tamil Nadu	0.0865	1.8047
Uttar Pradesh	0.0700	0.6990
West Bengal	0.0777	0.6825

Source: NSS 67th round, Key results of Survey for unincorporated Non-agricultural Enterprises (Excluding Construction) in India and ASI report for 2010-11 (3-digits level data aggregated)**.**

The above tables clearly show that West Bengal, Uttar Pradesh, Kerala and Bihar have a huge presence of unregistered sector when compared to their organized sector manufacturing base. In general, this gets reflected in their tax base as a percentage to GSDP, but here some of the worrisome cases are Madhya Pradesh, Punjab and even Andhra Pradesh despite having a better organized sector's presence in manufacturing compared to unorganized sector manufacturing and trade. Rather, Kerala has a better tax base possibly because of better performance of organised trade (which includes hotels and restaurants) and construction sectors.

Next, a panel fixed effect regression is run for 17 NS states with the following results. The general form is $y_{it} = a + b_1 Taxbase_{it} + b_2 Population_{it} + u_i + e_{it}$, ……..(1)

Where, y_{it} = own tax revenue for i-th state in t-th year, i=17, t=8, in current prices

Taxbase is as explained above and *population* is interpolated from 2001 and 2011 census figures for *I* and *t.*

u_i =*i*th fixed effect (for ith state)

e_{it}= White noise error term for *i* and *t*

Table 4: Panel Fixed Effect Regression for calculation of Tax Capacity (or Potential)

```
Fixed-effects (within) regression           Number of obs      =       136
Group variable: state                       Number of groups   =        17

R-sq:  within  = 0.9215                     Obs per group: min =         8
       between = 0.7976                                    avg =       8.0
       overall = 0.7934                                    max =         8

F(2,117)          =    686.69
corr(u_i, Xb)  = -0.7619                    Prob > F           =    0.0000


------------------------------------------------------------------------------
         otr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    taxbase |    .208422   .0093054    22.40   0.000     .1899931    .2268509
         pop |   .0247095   .0109626     2.25   0.026     .0029987    .0464204
       _cons |  -1453356   632944.6    -2.30   0.023    -2706869   -199842.2
-------------+----------------------------------------------------------------
     sigma_u |  1051289.9
     sigma_e |  243891.23
         rho |  .94892824   (fraction of variance due to u_i)
------------------------------------------------------------------------------

F test that all u_i=0:     F(16, 117) =    25.96                 Prob > F = 0.0000
```

From the above potential tax is calculated for each state, both with fixed state effect inserted and without that as a linear predicted value from the panel regression. The following table 5 gives the ratio of tax capacity to tax effort (or potential to actual own revenue collection)

Table 5: Tax potential as a ratio to Actual Tax for states, averages from 2006-08 and 2009-2011

States	Tax potential to Actual Tax ratio (Inverse of Tax Effort)
Andhra pradesh	1.0478
	0.937133
Bihar	0.752467
	1.2993
Chhattisgarh	1.1147
	0.9312
Goa	0.9841
	1.0351
Gujarat	0.950233
	1.130033

Haryana	0.880467
	1.184633
Jharkhand	0.9323
	1.0744
Karnataka	1.036533
	0.938267
Kerala	1.018533
	0.958767
Madhya Pradesh	1.111233
	0.927367
Maharastra	1.069933
	0.9723
Odisha	1.035267
	1.0323
Punjab	1.117833
	0.9657
Rajasthan	1.0018
	1.0348
Tamil nadu	0.9931
	1.028833
Uttar Pradesh	1.074933
	0.946433
West Bengal	1.0058
	1.047167

Note: same as Table 2
Source: Same as Tables 1 to 3.

Here, states having values less than 1 have performed better than potential, implying either better compliance, more efficiency or lesser amount of unorganized sector escaping the tax net. It is surprising to note that states which has lower tax base to GSDP ratio and high unorganized sector ratio, have done better than some states which have the opposite- for example Goa, Gujarat, and Tamil Nadu have worsened their performance in terms of tax effort while states like Kerala, Punjab, Uttar Pradesh and Madhya Pradesh have improved their tax ratios. However, some states have little volatility in their tax effort like West Bengal, Odisha and Rajasthan. The above regression has one problem of high multicollinearity. The following table 6 clarifies the issue (given on page 13)

In the above regression, seventeen dummies for 17 major states are incorporated and denoted as s_i. The conditional index also shows very high value for the variable population (more than 91). To overcome this, fixed effect regressions (actually LSDV type) with taxbase and population as separate regressors

were run. Table 7 below gives the case for Tax Base and Table 8 gives the same LSDV regression for population

We must note from the above regression that population has an extremely high VIF as well and this variable is really inflating the variance for other variables. Thus the natural choice would be tax base. We will come back to this after we report the results

Table 6: Collinearity Diagnostics for Panel Regression with both Taxbase and Population as regressors Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	s1	-1.205E6	836856.633	-.121	-1.440	.152	.011	94.189
	s2	-2.642E6	1.028E6	-.266	-2.569	.011	.007	142.245
	s3	-518752.847	257619.153	-.052	-2.014	.046	.112	8.926
	s4	-78540.570	87044.399	-.008	-.902	.369	.981	1.019
	s5	-2.419E6	531164.055	-.244	-4.554	.000	.026	37.945
	s6	-813632.738	238549.912	-.082	-3.411	.001	.131	7.653
	s7	-1.002E6	327618.619	-.101	-3.057	.003	.069	14.436
	s8	-642162.399	580626.495	-.065	-1.106	.271	.022	45.341
	s9	-576999.291	338062.624	-.058	-1.707	.091	.065	15.371
	s10	-1.340E6	733369.419	-.135	-1.827	.070	.014	72.334
	s11	-2.755E6	1.030E6	-.278	-2.675	.009	.007	142.624
	s12	-1.077E6	421165.824	-.109	-2.557	.012	.042	23.856
	s13	-349503.661	280990.386	-.035	-1.244	.216	.094	10.619
	s14	-1.590E6	676037.223	-.160	-2.352	.020	.016	61.467
	s15	-1.311E6	648227.231	-.132	-2.023	.045	.018	56.513
	s16	-4.003E6	2.040E6	-.403	-1.962	.052	.002	559.939
	s17	-2.383E6	912145.199	-.240	-2.613	.010	.009	111.899
	taxbase	.208	.009	.942	22.398	.000	.043	23.419
	population	.025	.011	.784	2.254	.026	.001	1.603E3

a. Dependent Variable: otr

b. Linear Regression through the Origin					

Table 7: Collinearity diagnostics for Panel fixed effect regression with taxbase as independent variable

Coefficients[a,b]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	s1	664589.900	111881.057	.067	5.940	.000	.615	1.627
	s2	-333123.498	91856.162	-.034	-3.627	.000	.912	1.097
	s3	27151.135	89308.194	.003	.304	.762	.964	1.037
	s4	-55136.636	87904.437	-.006	-.627	.532	.996	1.005
	s5	-1.260E6	134827.928	-.127	-9.344	.000	.423	2.363
	s6	-321795.421	98044.976	-.032	-3.282	.001	.800	1.250
	s7	-290525.858	90036.107	-.029	-3.227	.002	.949	1.054
	s8	644986.047	106798.815	.065	6.039	.000	.674	1.483
	s9	154672.530	96028.961	.016	1.611	.110	.834	1.199
	s10	300475.036	93413.760	.030	3.217	.002	.882	1.134
	s11	-469110.092	181377.441	-.047	-2.586	.011	.234	4.277
	s12	-149607.939	91478.965	-.015	-1.635	.105	.919	1.088
	s13	250563.781	91429.715	.025	2.741	.007	.920	1.087
	s14	-81821.744	97827.277	-.008	-.836	.405	.804	1.244

	s15	122543.571	127245.438	.012	.963	.337	.475	2.105
	s16	589627.739	109370.278	.059	5.391	.000	.643	1.555
	s17	-339732.687	101684.388	-.034	-3.341	.001	.744	1.344
	taxbase	.224	.006	1.014	36.367	.000	.101	9.947
a. Dependent Variable: otr								
b. Linear Regression through the Origin								

Table 8: Collinearity diagnostics for Panel fixed effect regression with Population as independent variable

Coefficients[a,b]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	s1	-1.430E7	1.371E6	-1.441	-10.432	.000	.021	48.208
	s2	-1.965E7	1.588E6	-1.980	-12.379	.000	.015	64.662
	s3	-4.392E6	437280.811	-.442	-10.043	.000	.204	4.905
	s4	-170385.151	199088.374	-.017	-.856	.394	.984	1.017
	s5	-9.687E6	962866.503	-.976	-10.061	.000	.042	23.782
	s6	-3.892E6	446476.552	-.392	-8.716	.000	.196	5.114
	s7	-6.068E6	542649.561	-.611	-11.182	.000	.132	7.554
	s8	-9.469E6	976388.246	-.954	-9.698	.000	.041	24.455
	s9	-5.530E6	585473.028	-.557	-9.446	.000	.114	8.793
	s10	-1.324E7	1.158E6	-1.334	-11.436	.000	.029	34.377
	s11	-1.771E7	1.795E6	-1.784	-9.862	.000	.012	82.695
	s12	-7.694E6	687356.317	-.775	-11.193	.000	.083	12.120

	s13	-4.501E6	483522.707	-.454	-9.310	.000	.167	5.997
	s14	-1.234E7	1.091E6	-1.243	-11.311	.000	.033	30.510
	s15	-1.079E7	1.124E6	-1.088	-9.602	.000	.031	32.410
	s16	-3.768E7	3.158E6	-3.797	-11.930	.000	.004	255.891
	s17	-1.705E7	1.454E6	-1.718	-11.722	.000	.018	54.253
	pop	.211	.016	6.693	12.894	.000	.001	680.742
a. Dependent Variable: otr								
b. Linear Regression through the Origin								

In the above tables 6 to 8, s_i variables are all state level dummies which exhibit explicitly the state level fixed effects with magnitude, sign and significance level. Comparing the two tables 7 and 8, the interesting observation is that for population regression, the variable population has high conditional index as well as VIF, although the state specific dummies are significant. On the other hand, the taxbase regression has reduced the problem of multicollinearity to more or less insignificant levels, although making some of the state dummies insignificant too in the process. However, considering the overall robustness of the estimates, tax base is certainly a better alternative. Using this estimate, the predicted values of own tax revenue (which is the own tax potential) could be calculated and the ratio of this prediction to actual tax ratios for two averages, one from 2005 to 2008 and the other from 2009 to 2012 (following three year averages as noted earlier) is reported in Table 9 below.

Table 9: Tax potential as a ratio to Actual Tax for states, averages from 2006-08 and 2009-2011, when taxbase is the regressor alone

States	Tax potential to Actual Tax ratio (Inverse of Tax Effort)
Andhra pradesh	1.044797476
	0.94156994
Bihar	0.836654474
	1.202714941
Chhattisgarh	1.137176036
	0.908782042
Goa	0.965229215
	1.054369572
Gujrat	0.943325322

	1.142193053
Haryana	0.866526864
	1.200766918
Jharkhand	0.957756471
	1.031903891
Karnataka	1.040074491
	0.936868542
Kerala	1.004942475
	0.973289912
Madhya pradesh	1.117363717
	0.909388193
Maharashtra	1.067858593
	0.977175671
Odisha	1.045327236
	1.024199277
Punjab	1.116444223
	0.968759213
Rajasthan	1.006572825
	1.019583118
Tamil Nadu	0.993399661
	1.034882143
Uttar Pradesh	1.083499231
	0.914184181
West Bengal	1.010011378
	1.036624636

Note: As in Table 2 above

Table 5 and 9 have identical qualitative conclusions and surprisingly, the quantitative values are also very close to each other. However, in terms of econometric methodology, Table 9 is more appropriate. There exists a crucial difference though- that is in terms of statewise dummies representing statewise fixed effects in the underlying regressions namely Table 4 and Table 7 respectively. The values for fixed effects for the two tables are different quite significantly. We report only for the table 7.

Table 10: Statewise fixed effect value in Rupees lakhs (Current Prices) for the period 2004-05 to 2011-12 for Tax base regression reported in Table 7

States	Fixed Effect Values
Andhra pradesh	664589.90***
Bihar	-333123.50***
Chhattisgarh	27151.14
Goa	-55136.64
Gujarat	-1260000.00***
Haryana	-321795.42***
Jharkhand	-290525.86***
Karnataka	644986.05***
Kerala	154672.53
Madhya pradesh	300475.04***
Maharashtra	-469110.09**
Odisha	-149607.94
Punjab	250563.78***
Rajasthan	-81821.74
Tamil nadu	122543.57
Uttar Pradesh	589627.74***
West Bengal	-339732.69***

Note: *** and ** mean significant at 1 and 5 per cent respectively
Source: Same as in Table 2 and 3

From the above table it is clear that some states have state specific reasons (negative and significant values for fixed effects) apart from low tax base for having comparatively low own tax collection. These may include inefficiency, less compliance, more zero-rated goods among other reasons. Combining tables 9 and 10, one point of satisfaction is that even if inefficiency or less compliance exists, it is more or less at tolerable levels, except perhaps Bihar and Haryana during 2009-2012 and Chattisgarh, Madhya Pradesh and Punjab during 2005-2008.

In Table 11 below, we present another interesting fact. Using tax base and LSDV method, the ratio of Own Tax collection as a ratio to Tax base improves the ranking of performance of some states said to be under fiscal duress. Let us first present the table 11 below.

Table 11: Own Tax Revenue (OTR) as percentages to Tax Base (TBASE) and GSDP during 2005-08 and 2009-12 (Averages) along with their decile ranks

States	OTR to GSDP Ratio	Decile Ranks of OTR to GSDP ratio	OTR to TBASE Ratio	Decile Ranks of OTR to TBASE Ratio
States	OTRGSDPRATIO	OTRGSDPDECILE	OTRTBASERATIOAV	OTRTBASEDECILE
Andhra Pradesh	7.8867	9	27.74	9
	7.5767	8	28.52	9
Bihar	4.0833	1	14.86	2
	4.6333	2	14.57	1
Chhattisgarh	7.1167	7	20.61	5
	7.5267	8	25.62	7
Goa	7.1433	7	16.64	3
	5.87	3	16.99	3
Gujarat	6.52	4	14.57	1
	6.7033	5	14.84	2
Haryana	7.5133	7	19.78	5
	6.3767	3	16.11	3
Jharkhand	5.02	2	13.49	1
	5.7767	3	14.91	2
Karnataka	9.9433	10	28.45	9
	9.3967	10	29.43	10
Kerala	7.82	8	25.16	7
	7.84	9	24.92	7
Madhya Pradesh	7.2033	7	25.98	8
	8.07	9	29.35	10
Maharashtra	6.9233	5	19.17	4
	7.02	6	21.57	6
Odisha	5.5467	2	17.81	4
	5.7167	3	19.34	5
Punjab	6.6667	5	26.01	8
	7.06	6	28.12	9
Rajasthan	6.69	5	20.99	5
	6.58	4	21.17	6
Tamil Nadu	8.59	9	23.55	7
	8.63	10	22.35	6
Uttar Pradesh	6.6	4	26.38	8
	6.9867	6	29.25	10
West Bengal	4.3567	1	17.64	3
	4.3867	1	18.67	4

Note: (a) Same as in Table 2 and (b) In decile rank lowest is given the value 1 and the highest is given a value 10

The Table 11 shows that West Bengal, which is at the lowest rank (Bottom 10 percent) when OTR is calculated as a ratio to GSDP improves it rank to 4th decile from below (Bottom 40 per cent) when OTR is calculated as a ratio of Tax Base and among 17 states, in terms of 2009-12 average from Tax base point of view, its tax collection is better than 5 states. In terms of GSDP percentage, its own tax collection percentage was better than none. Similar Remarkable improvement in ranking is observed for Punjab and Uttar Pradesh. The opposite of significant worsening of rank is observed for Tamil Nadu and Gujarat.

Secondly, in terms of tax base, tax collection has improved for 12 states in 2009-12 from 2005-08. Two states have no change in ranking and 3 states have decline in ranking. If one compares the same for GSDP, own tax collection has improved for 11 states with no change in rankings for 2 states and decline for 4 states. However, the states which scored better in GSDP ranking may not have done so in Tax base ranking and vice versa. The following table 11 gives the relative picture

Table 12: Comparative Change in Ranking of OTR as percentage of GSDP and Tax Base respectively between the two averages (2005-08 and 2009-12)

Sates	OTR to GSDP Ratio	OTR to TBASE Ratio
Andhra Pradesh	**Fall**	**Unchanged**
Bihar	**Rise**	**Fall**
Chattisgarh	**Rise**	**Rise**
Goa	**Fall**	**Unchanged**
Gujarat	**Rise**	**Rise**
Haryana	**Fall**	**Fall**
Jharkhand	**Rise**	**Rise**
Karnataka	**Unchanged**	**Rise**
Kerala	**Rise**	**Unchanged**
Maharashtra	**Rise**	**Rise**
Madhya Pradesh	**Rise**	**Rise**
Odisha	**Rise**	**Rise**
Punjab	**Rise**	**Rise**
Rajasthan	**Fall**	**Rise**
Tamil Nadu	**Rise**	**Fall**
Uttar Pradesh	**Rise**	**Rise**
West Bengal	**Unchanged**	**Rise**

Several suggestions emerge from this. Let us take the fiscal distance criterion used by FC-XIII, which has been assigned highest weight for devolution (47.5 per cent). First, it makes more sense to judge tax effort based on Tax base rather than GSDP. This would do more justice to tax collection efforts of the

state. Second, states which have worsened their average performance over time need to be given support so that they can overcome the downward trend. Third, states which are in the bottom half of decile ranking in terms of tax potential calculated from tax base, also needs special support so that they could improve their tax ratios. For both second and third points, the high and significant negative values of fixed effects point towards some inefficiency and non-compliance for tax collection. States which could be identified in this regard are Gujarat, Maharashtra, West Bengal, Haryana, Jharkhand and Bihar. Unless this is eliminated, tax devolution will take care of fiscal distance but by the same formula will penalize states which have eliminated such inefficiency. Some thoughts need to be given as to how one can incorporate the fixed effect inefficiencies in the fiscal distance concept.

However, in this paper, the calculation of tax potential with tax base as regressor is calculated with another purpose, which perhaps is of bigger concern and importance for sustenance of a sound federal financial structure. The main contention of this paper is that fiscal capacity distance and fiscal discipline, the two main heads considered by the 13th finance commission for tax sharing purpose (contributing 65 per cent share in weights for horizontal tax devolution), cannot be taken to be independent variables. This is because the need for devolution from central pool is to ensure that the growth potential of states is fully realized along with providing maximum feasible welfare to the people. If one takes fiscal capacity distance as a growth inhibiting factor for a state compared to more successful states, then devolution for fiscal capacity distance must be linked to fiscal discipline in such a way that growth potential of the state is not stifled for the lack of physical or human capital and welfare of the people in the state is not compromised. The link between the two is not very easy to establish, both for lack of suitable data at the sub-national level and absence of an appropriate methodology to establish such a linkage. This is taken up in the next section.

3. Measure and criteria for fiscal discipline

The concept of fiscal discipline is important and centre and states, both must try to adhere to this. In the 13th Finance Commission, the formula for this is in terms of own revenue divided by revenue expenditure for individual states relative to the value for 28 states. The idea is that if the states have improved this ratio in 2005-08 compared to 2001-04, they should be rewarded.

The states which are lagging behind may be so for several reasons, namely (a) tax evasion is high (b) the state is unable to control wasteful revenue expenditure (c) the state may be unable to improve tax collection since infrastructure or public capital is inadequate and (d) somewhat related to the earlier points, formal sector manufacturing has not flourished in these states. It seems that the 13th finance

commission is somewhat biased in favour of the first two points- that is tax evasion is rampant and the states are having too high wasteful expenditure. This is not really conducive to faster growth of a laggard state.

The fiscal discipline in this case should rather consider a growth targeting which must take into account need for public capital. The 13th finance commission stressed the need for higher capital expenditure on the part of states which have low ratio of capital outlay to GSDP. In fact, Finance Commission is besieged with the matter as is evident from reports of several finance commissions in the past few years. The 13th finance commission report states the problem as follows- "In the case of states having revenue deficit in 2007-08, we recognise that the process of adjustment in the revenue deficit would have a concomitant virtuous impact on the fiscal deficit. Since we have recommended an achievable correction path for revenue deficit, an abrupt reduction in fiscal deficit would lead to compression of capita l expenditure, which is not desirable. Thus, it is required that a fiscal deficit higher than 3 per cent is allowed till the revenue deficit comes down to a certain level, so as to prevent any undesirable compression of capital expenditure. We have noted in these states' memoranda their willingness to attempt a fiscal correction exercise that would allow them to maintain and even increase their fiscal space for capital expenditure. Thus, in the case of these states, the fiscal adjustment path requires them to have capital expenditure less than the states that have already carried out fiscal correction, but with a slightly relaxed fiscal deficit target in the years 2011-12 and 2012-13, so that capital expenditure is not compressed to undesirable levels. Moreover, additional reduction in the revenue deficit will allow these states greater fiscal space on the capital account." (FC-XIII report, Ch 9, Section 9.76, PP 138-39)

The FC-XIII has put a weight of 17.5 per cent to Fiscal Distance which is based on the ratio of revenue expenditure to revenue earning of states. The quotation from FC-XIII report in the earlier paragraph clearly implies that for true meaning of fiscal discipline concept, consideration of only revenue expenditure is inadequate. Rather, one may consider a ratio like T/G which is own tax revenue to total government expenditure (revenue plus non-debt capital). Such actual ratio for three years needs to be compared to a target T/G ratio calculated through a growth maximization exercise. It is clear the problem arises for those states whose target T/G ratio exceeds the actual T/G ratio. The fiscal discipline rule must consider the fact that unless targeted growth is achieved, a lagging state will remain forever laggard.

The real problem is that giving arbitrary relief in terms of higher fiscal deficit as permitted by 13th finance commission for Punjab, Kerala and West Bengal do not solve the long term issue. The main issue is allowing relief to states having lower capital outlay so that they could reach a pre-determined target expenditure calculated from a growth maximization exercise. But such ad-hoc relief provides marginal increment in capital outlay which is insufficient to produce a desired level of growth. The indivisibility of public capital in many cases requires a big-push so that the capital outlay needs to be raised significantly at one go. The approach of thirteenth FC also suffered from this myopic vision as can be inferred from the following quote -

"In other words, the increase in (fiscal) deficits (in Bihar during Thirteenth Finance Commission's tenure) will primarily be due to an increase in the development expenditure of the state, provided the growth of expenditure remains at the observed level used for the projection. Given low development spending (in per capita terms) vis-ा-vis other states and corresponding physical and social infrastructure deficits, such an increase in government expenditure would not be possible if the THFC'S proposed fiscal consolidation path is stuck to, unless state revenue increases accordingly, which is unlikely given the low resource base of the state..... So if the government of Bihar has to adhere to the fiscal consolidation path proposed by the THFC, it has to happen through a cut in development spending (Chakraborty, 2010, p.60)".

To overcome such problems, we have calculated own-tax revenue capacity and required expenditure need to meet a target growth rate. Need is calculated on the basis of a simple formula developed by us following Barro (1990).

There are three main divisions of government expenditure:

i. Revenue Account
ii. Capital Account
iii. Debt (comprising public debt, loans and advances and inter-state settlement)

Main objective of capital expenditure is of creating assets of material character. Government expenditure can also be presented as: development expenditure and non development expenditure. Expenditures on debt services are neither classified as development nor as non-development expenditure. Items that generally promote economic development and social welfare are broadly included under the head development expenditure.

3.1 Theoretical Model and Empirical Estimates

We consider development expenditure on revenue account and capital outlay[1] as expenditure that enhances growth. We term this as government investment expenditure and other expenditure as consumption expenditure. Government investment expenditure enters into the production function of the firm as a productive input and optimum value of $G_I(t)$ can be obtained from the growth maximizing exercise.

Following Barro (1990) we consider an economy where infinitely lived households maximizes overall utility given by

$$U = \int_0^\infty u(c)e^{-\rho t}\,dt = \int_0^\infty \frac{c^{1-\sigma}-1}{1-\sigma}e^{-\rho t}\,dt \qquad (1)$$

where c is the consumption per person, $\rho > 0$ is the constant rate of time preference, σ is the elasticity of substitution.

Household producer produces society's consumable output y using public capital and private capital per person. The production function is given by

$$y = f(G_I, k) = AG_I^{\beta}k^{\alpha} \qquad (2)$$

where A is the technology parameter, G_I :public investment, k: per person private gross fixed capital formation.

The government chooses G_I and imposes tax at the rate τ proportional to income, which in turn affects each household's consumption decision over time.

Given this, using the Hamiltonian principle we can solve the growth rate of consumption per person as

$$\gamma = \frac{\dot{c}}{c} = \frac{1}{\sigma}\left[(1-\tau)\frac{\partial y}{\partial k} - (n+\rho)\right] = \frac{1}{\sigma}\left[(1-\tau)A\alpha k^{\alpha-1}G_I^{\beta} - (n+\rho)\right] \qquad (3)$$

Taking $\bar{\gamma}$ as the target growth we can solve the above equation for optimum value of G_I.

Thus $G_I^* = \left(\frac{.515\bar{\gamma} + n + \rho}{\hat{A}\hat{\alpha}k^{\hat{\alpha}-1}(1-\hat{\tau})}\right)^{1/\hat{\beta}}$ ……(4)

Havranek et. al (2013) reported mean elasticity of inter-temporal substitution (EIS) in consumption value collected from different studies for individual countries including India. They reported that mean EIS value for India is 0.515.

We have estimated investment expenditure of the government for the years 2004-05 to 2011-12. For each year actual per capita GSDP growth rate was assumed as $\bar{\gamma}$, which is derived from subtracting population growth rate from actual growth rate of GSDP calculated from National Accounts Statistics.

1 Consisting of capital expenditure excluding discharge of internal debt, repayment of loans to the centre, loans and advances by the state governments.

This will help us in analyzing the actual investment expenditure by a particular state relative to the estimated required investment expenditure $\left(G_I^*\right)$to attain that growth rate. If (G_I / G_I^*) is less than one then it implies that state is spending less than required for investment purposes and vice-versa.

On the other hand, optimal consumption expenditure G_c^* is not calculated as an intertemporal exercise, since in standard growth models, consumption expenditure does not promote growth. So, G_c^* is assumed to be equal to 3 years moving average for the periods considered in our study. The aggregate optimal government expenditure is written as $\hat{G} = G_I^* + G_c^*$.

Annual rates of growth of population during 2001 and 2011 for different states are considered as n.

Wang, Rieger and Hens (2011) estimated time discount factor for 45 countries. Time discount rate R is defined as

$R = \left(\frac{F}{P}\right)^{(1/t)} - 1$, where P is the present value of cash flow, F is the future value, t is the time.

They considered risk less discount rate as i and one time discount factor as d and thus

$F = P(1+d)(1+i)^t$ thus $R = [(1+d)^{1/t}(1+i)] - 1$

On the basis of estimated median values of i and d we find that median R for t=9 as considered by them as 0.323.

It is also argued that time discount rate is higher the more impatient the country is. Taking this argument we also assumed different values of ρ for different states. We ranked states according to the per person private capital. We assume that lower the level of private investment in a state higher is the level of impatience and thus higher should be the value of ρ for that state. We considered 0.35 as the median value and different states were given different values of ρ according to per person private investment level.

We have estimated τ as the ratio of all types of taxes[2] collected from the state to Gross state domestic product (GSDP at constant prices).

Other expenditures of the states are assumed to be determined historically. So for this account we take three years moving average as the estimate of government consumption expenditure, which is already defined earlier as government expenditure other than developmental expenditure on revenue account and capital outlay.

Adding required investment and consumption expenditure we get the expenditure need of the state.

2 Net direct taxes collected by the central government, state own tax revenue, state own non tax revenue (revenue account). Direct tax data were found only for the years 2009/10, 2010/11, 2011/12. Average of direct taxes to GSDP ratios were taken as the average direct tax rate collected from that state. Ratios of state own revenue collection to GSDP for different years were taken to estimate τ .

This expenditure needs to be financed either through own revenue collection or transfer from the centre or borrowing. State governments collect revenue mainly from imposition of taxes and non tax revenue So we consider own tax potential to required expenditure need as the level that a state can earn given its need. Now we can compare this to actual own tax to total expenditure. As already mentioned problem arises for those states whose target T/G ratio exceeds the actual T/G ratio.

We have considered a similar formula for fiscal discipline as in the 13th finance commission (Report, Vol 1, p.124). However, as mentioned earlier, we believe that tax effort showing tax capacity and efficiency and developmental need must be viewed together to do justice for horizontal equity in terms of both growth and welfare. We will define the new measure later in this section. But this may produce the standard moral hazard problem whereby some states will never be able to reach the optimal growth (with some degree of deviation following the standard deviation rules). Thus, this benefit needs to be time bound so that a state failing to achieve it without a strong reason will have a progressively lower benefit due to fiscal indiscipline.The present proposal will try to find out a suitable formula as to how the devolution to states should be linked to need and tax effort. We will suggest the formula for a reasonable devolution based on the stated criterion (along with some standard ones like population and area). This would suggest a declining devolution over time giving sufficient time for states to initiate investment to create significant new public capital. The formula will be empirically tested for data from different states.

We have collected data from different issues of State Finances published by Reserve Bank of India. Variables that we have considered for our analysis are state own tax revenue, state own non tax revenue, Capital outlay, total capital disbursement, total revenue expenditure, total developmental expenditure.

Gross State domestic product at constant 2004-05 prices and current prices were collected from National Accounts Statistics. We estimated GSDP deflator for different years and used those values to convert nominal data in real term. Our growth targeting analysis is based on data presented in real terms.

Population data are taken from Census of India for the years 2001 and 2011. We have estimated population values of other years using the exponential growth rates.

Rajeswari, Sinha Ray and Sahoo (2009) estimated private GFCF for the years 1999-00 to 2005-06. We have considered those values and used those values to predict GFCF by the private sector for other years.

Total period taken for growth targeting analysis is 1999/00 to 2010/11.

The empirical model that has been considered for estimation of the coefficients of the Barro type production function using public capital is as follows:

$$\ln y_t = \ln A + \beta \ln G_{1t} + \alpha \ln k_t + u_{it}$$

Panel data estimation technique is used to estimate coefficients. We applied random effect model and fixed effect model on our data. We have considered 17 major states for the period 1999/00 to 2010/11. Breusch and Pagan LM test for random effects and Hausman test for random effects were also performed. We reject random effect model over fixed effect.

```
Random-effects GLS regression                   Number of obs      =       197
Group variable: panel                           Number of groups   =        17

R-sq:  within  = 0.7791                         Obs per group: min =        10
       between = 0.6166                                        avg =      11.6
       overall = 0.5906                                        max =        12

Random effects u_i ~ Gaussian                   Wald chi2(2)       =    569.68
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
```

pc_gsdp1	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
dev1	.1947161	.0349558	5.57	0.000	.126204	.2632283
pc_gfcf1	.2537447	.0199403	12.73	0.000	.2146623	.292827
_cons	3.039148	.7840572	3.88	0.000	1.502424	4.575872
sigma_u	.1692507					
sigma_e	.09319649					
rho	.76733826	(fraction of variance due to u_i)				

```
Breusch and Pagan Lagrangian multiplier test for random effects

        pc_gsdp1[panel,t] = Xb + u[panel] + e[panel,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                pc_gsdp1 |    .2796466       .5288162
                       e |    .0086856       .0931965
                       u |    .0286458       .1692507

        Test:   Var(u) = 0
                                  chi2(1) =  290.10
                               Prob > chi2 =    0.0000
```

```
Fixed-effects (within) regression               Number of obs      =       197
Group variable: panel                           Number of groups   =        17

R-sq:  within  = 0.8187                         Obs per group: min =        10
       between = 0.0031                                        avg =      11.6
       overall = 0.0477                                        max =        12

                                                F(2,178)           =    401.77
corr(u_i, Xb)  = -0.4028                        Prob > F           =    0.0000
```

pc_gsdp1	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dev1	.4214755	.037832	11.14	0.000	.3468185	.4961325
pc_gfcf1	.1290911	.0209635	6.16	0.000	.0877222	.1704601
_cons	-1.652282	.8251002	-2.00	0.047	-3.280518	-.0240447
sigma_u	.5707317					
sigma_e	.09319649					
rho	.97402793	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(16, 178) =    50.11                 Prob > F = 0.0000
```

```
                 ---- Coefficients ----
                 (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
                  .           re4         Difference          S.E.
-------------------------------------------------------------------------------
       dev1      .4214755    .1947161       .2267593        .0144691
  pc_gfcf1       .1290911    .2537447      -.1246535        .0064692
-------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
        B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(2) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =      218.10
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

Estimates of technology parameters using Fixed Effect Model for Individual States are given in the table below

Table 13: The estimated technology parameter denoting efficiency

State	Estimated A
Andhra Pradesh	0.14981**
Bihar	0.092794***
Chattisgarh	0.203484**
Goa	1.042349
Gujarat	0.198765*
Haryana	0.301412
Jharkhand	0.169907**
Karnataka	0.169467**
Kerala	0.261258*
Madhya Pradesh	0.126786**
Maharashtra	0.173218**
Odisha	0.171958**
Punjab	0.312983
Rajasthan	0.142195**
Tamil Nadu	0.181494**
Uttar Pradesh	0.075387***
West Bengal	0.161572**

As Table 13 shows, all states have significant positive efficiency factor except for Goa, Haryana and Punjab.

This somewhat matches the story of falling or stagnant tax collections to tax base in Goa and Haryana as reported in Table 12 above.

Table 14: The Discount rate ρ representing rate of time-preference

State	rho	Per Capita Private GFCF
Andhra Pradesh	0.35	12031.1
Bihar	0.60	475.1722
Chattisgarh	0.05	34267.66
Goa	0.05	97353.35
Gujarat	0.35	15007.65
Haryana	0.15	32580.16
Jharkhand	0.15	14979.9
Karnataka	0.25	13747.03
Kerala	0.25	21666.84
Madhya Pradesh	0.60	4608.073
Maharashtra	0.25	20419.75
Odisha	0.35	10522.58
Punjab	0.25	17255.07
Rajasthan	0.45	7685
Tamil Nadu	0.15	26817.01
Uttar Pradesh	0.45	5288.051
West Bengal	0.45	7782.111
Correlation Coefficient between rho and per capita private GFCF= -0.7076 and Significant at 1 per cent level		

Note: Based on Wang, Rieger and Hens (2011)
Source: For private GFCF, the source is Rajeswari, Sinha Ray and Sahoo (2009)

Table 14 above may generate controversy, but there is hardly any credible study on this for India. We relied on Wang, Rieger and Hens (2011) who have done experimental study on this over 45 countries with different per capita GDP levels. As already mentioned earlier, we have followed a simple rule- states with higher per capita private fixed capital (GFCF) are assumed to have a higher savings propensity, hence a lower discount rate. The correlation of ρ values and GFCF is negative and highly significant- but exact values are guesses based on reasonable values found in Wang et al surveys.

The next task is to get an estimate about the true need of a state to spend on developmental expenditure head in terms of historical growth achieved. The idea behind this is the possible fact that some states might be spending too much on aggregate government expenditure based on its technical efficiency and tax effort. Table 15 below gives an idea about the actual government expenditure and the needed optimal expenditure as calculated by us through the inter temporal optimization done before.

Table 15: Comparative Study of Actual Public Investment Expenditure and Expenditure Need to meet Actual Growth Rate Achieved

State	Period	Average Public Investment Expenditure[3]		Actual Investment To Investment Need
		Need	Actual	
Andhra Pradesh	2006/07 to2008/09	749,000,000,000	352,666,666,667	0.4709
	2009/10 to 2011/12	1,540,000,000,000	441,000,000,000	0.2864
Bihar	2006/07 to2008/09	5,570,000,000	169,333,333,333	30.4010
	2009/10 to 2011/12	3,900,000,000	230,333,333,333	59.0598
Chattishgarh	2006/07 to2008/09	759,000,000,000	80,400,000,000	0.1059
	2009/10 to 2011/12	1,980,000,000,000	125,000,000,000	0.0631
Goa	2006/07 to2008/09	517,000,000,000	21,566,666,667	0.0417
	2009/10 to 2011/12	1,000,000,000,000	29,933,333,333	0.0299
Gujarat	2006/07 to2008/09	738,000,000,000	246,000,000,000	0.3333
	2009/10 to 2011/12	976,000,000,000	328,666,666,667	0.3367
Haryana	2006/07 to2008/09	833,000,000,000	131,000,000,000	0.1573
	2009/10 to 2011/12	1,620,000,000,000	158,000,000,000	0.0975
Jharkhand	2006/07 to2008/09	397,000,000,000	101,533,333,333	0.2558
	2009/10 to 2011/12	3,830,000,000,000	128,000,000,000	0.0334
Karnataka	2006/07 to2008/09	1,260,000,000,000	279,000,000,000	0.2214
	2009/10 to 2011/12	1,910,000,000,000	348,000,000,000	0.1822
Kerala	2006/07 to2008/09	595,000,000,000	106,333,333,333	0.1787
	2009/10 to 2011/12	1,310,000,000,000	151,333,333,333	0.1155
Madhya Pradesh	2006/07 to2008/09	183,000,000,000	176,000,000,000	0.9617

3 Estimated from equation 4 above

	2009/10 to 2011/12	395,000,000,000	299,333,333,333	0.7578
Maharashtra	2006/07 to2008/09	2,570,000,000,000	474,000,000,000	0.1844
	2009/10 to 2011/12	4,700,000,000,000	641,000,000,000	0.1364
Orissa	2006/07 to2008/09	344,000,000,000	106,666,666,667	0.3101
	2009/10 to 2011/12	935,000,000,000	155,666,666,667	0.1665
Punjab	2006/07 to2008/09	269,000,000,000	96,100,000,000	0.3572
	2009/10 to 2011/12	562,000,000,000	110,800,000,000	0.1972
Rajasthan	2006/07 to2008/09	412,000,000,000	194,000,000,000	0.4709
	2009/10 to 2011/12	735,000,000,000	222,000,000,000	0.3020
Tamilnadu	2006/07 to2008/09	2,600,000,000,000	279,000,000,000	0.1073
	2009/10 to 2011/12	6,220,000,000,000	386,000,000,000	0.0621
Uttar Pradesh	2006/07 to2008/09	803,000,000,000	441,000,000,000	0.5492
	2009/10 to 2011/12	1,630,000,000,000	532,333,333,333	0.3266
West Bengal	2006/07 to2008/09	268,000,000,000	207,000,000,000	0.7724
	2009/10 to 2011/12	580,000,000,000	269,000,000,000	0.4638

Above estimates are based on actual growth rates achieved by individual states given estimated technology parameters, rate of time preference and the per capita private capital level of that state. It is observed that in Bihar actual per capita investment is very low as a result of which the growth actually achieved by the state could have been achieved by much lower level of public investment. Our model predicts that with such a low level of per capita private investment it is very difficult to achieve higher per capita output growth just by raising public investment. Higher level of per capita private investment is essential to raise growth rate. In all other states public investment needed to meet actual growth rate and maximize consumer welfare is much higher than what actually these non-special states have spent. In other words, states have achieved growth but not maximum welfare – or this is growth without optimum welfare. We have also observed that revenue (both tax and non-tax as well as direct taxes) to GSDP rate is also very low in Bihar as compared to other states as a result of which estimated public investment expenditure is low for Bihar. It is also observed that over these two periods realization of need (as measured by proportion of actual to need) has decreased over time. This decrease is very high for Jharkhand possibly due to high growth of per capita private GFCF.

The ratio of actual to optimal public expenditure values differ from state to state. Any deviation of this ratio from one indicates inefficiency in state in terms of allocating resources. States may have

achieved that actual growth rate without maximization of social welfare. We observe that Bihar, Goa, Jharkhand and Madhya Pradesh are the states where estimated expenditure to meet actual growth that also maximizes social welfare was lower than estimated. Except Bihar, in all other states actual public investment expenditures have been found to be lower than the estimated values but optimal public investment plus consumption expenditure turned out to be higher than actual value due to high level of public consumption expenditure.

Planning commission (2012) has set some target growth rate for individual states as well as total investment in a state in proportion to GSDP for the period 2012-2017. Predicted per capita private investment in Bihar based on Rajeswari, Sinha Ray and Sahoo (2009) is found to be much lower than what planning commission has estimated[4]. For Bihar, we have deducted 8 percent from the predicted percentage of GFCF (total) rate and applying that rate to the GSDP figure obtained level of private investment for Bihar. This gives much higher value of public investment for Bihar and thus we set higher value of optimal G for Bihar. Following table shows the optimal total government expenditure for the year 2012 taking planning commission's target growth rate.

Table 16: Estimated Public Expenditure for 2012-13 to meet Planning Commission Target Growth

State	Estimated Own Tax/GSDP Ratio ($\bar{t}$)[5] (2012-13)	Optimal & Estimated $\hat{G}^*$[6] (2012-13)	$\hat{G}^*$ to GSDP (2012-13)	$\left[\left(\frac{\hat{G}^* - \bar{T}}{\bar{T}}\right) * \overline{\left(\frac{T}{\hat{T}}\right)}\right]$[7] (2012-13)	% of Estimated (& Optimal) Expenditure not Financed Estimated own tax revenue [8]	Proportion of transfer[9] to Estimated deficit (%)
Andhra Pradesh	0.0749088	2,009,028,862,510	0.4722	5.303553	83.63 (9)	18.16 (9)
Bihar	0.0422838	2,235,005,771,471	0.7241	16.12586	94.22 (1)	18.44 (7)

4 It is argued that public investment is fixed at 8 percent of GSDP.

5 $\bar{t}$ was estimated by applying 3 years moving average method on actual own tax to GSDP of 2004/05 to 2010/11.

6 Public investment is estimated using equation (4) by incorporating value of projected per capita private GFCF and target yearly growth rate set by Planning commission for the period 2012/13 to 2016/17 and yearly rate of growth of population during the period 2001 and 2011. 3 years moving average method was applied on public consumption expenditure data for the same period and that value is taken as the estimate of public consumption expenditure. $\hat{G}^*$ is nothing but estimates public invest expenditure added to estimated public consumption expenditure.

7 $\bar{T} = \bar{t}Y_{2012\text{-}13}$, $\overline{\left(\frac{T}{\hat{T}}\right)}$ was estimated by applying 3 years moving average method on actual $T/\hat{T}$ of 2004/05 to 2010/11.

8 Estimated using the formula $\left(1 - \bar{T}/\hat{G}^*\right)100\%$

9 Based on mean transfer of 2006/07 to 2010/11,

Chattisgarh	0.0701107	421,115,983,357	0.2629	2.749622	72.70 (17)	34.71 (2)
Goa	0.0721797	89,926,201,991	0.3571	3.947445	80.39 (12)	11.85 (15)
Gujarat	0.0633619	1,241,845,359,441	0.2886	3.555548	77.49 (15)	16.24 (11)
Haryana	0.0779831	759,844,155,629	0.3981	4.104676	81.40 (11)	9.44 (16)
Jharkhand	0.0468198	813,697,356,265	0.7867	15.80365	93.71 (2)	15.79 (12)
Karnataka	0.0933617	1,303,529,945,961	0.4293	3.597803	77.87 (14)	18.30 (8)
Kerala	0.0764773	913,383,020,822	0.5435	6.106589	85.82 (8)	14.52 (13)
Madhya Pradesh	0.0703831	1,272,269,603,252	0.5265	6.480819	86.14 (7)	25.86 (3)
Maharashtra	0.0708594	2,206,432,173,974	0.2616	2.691259	73.55 (16)	19.33 (5)
Orissa	0.0539838	1,048,336,049,166	0.7351	12.61746	92.42 (4)	21.04 (4)
Punjab	0.0716723	849,132,584,684	0.5161	6.200991	86.80 (6)	9.09 (17)
Rajasthan	0.0654624	1,320,008,100,680	0.5478	7.368695	87.85 (5)	19.01 (6)
Tamilnadu	0.086601	1,829,147,556,517	0.4053	3.680023	78.89 (13)	17.24 (10)
Uttar Pradesh	0.0634318	1,737,485,915,203	0.3903	5.153048	83.20 (10)	45.91 (1)
West Bengal	0.0449269	2,108,153,871,790	0.5958	12.26255	92.66 (3)	14.36 (14)

Above table reports the estimated target government expenditure level as well as the estimated own tax collection of the state in proportion to GSDP. Numbers in the bracket shows rank of the state. 1st rank is given to the state having highest ratio of estimated deficit not financed by own tax revenue to estimated deficit. We find that own revenue collection of a state is much lower than its expenditure need. The most important point to note in this context is the fact that the way aggregate expenditure is calculated, the optimal part of it is in terms of developmental expenditure. The reason some of the states have such a high deficit not financed by own tax revenue is the rather high gap between required development expenditure and the actual one. Thus financing the deficit gap assumes great significance in our exercise in terms of sustainable growth, inter-temporal maximum welfare and declining deficit gap over time due to increased tax effort.

Top five states which are unable to finance its expenditure need from own tax collection are Jharkhand, Bihar, Orissa, West Bengal and Rajasthan. In terms of share of transfer from centre to these states we find that if we rank the states in terms of largest share of central transfer to deficit ratio

only Orissa comes in top five. Rank of Rajasthan is six and that of Bihar is 7. Jharkhand's rank is twelve and West Bengal's rank is fourteen. Hence there is a mismatch in ranking of the states in terms of transfer received and requirement as per true developmental needs. Thus, if the transfer comes at the same rate as deficit not met by own tax revenue, then West Bengal will come in top five states that have to rely heavily on market borrowing to finance its deficit to meet Planning Commission's growth target. Same story holds for Punjab and Kerala too. Proportion of estimated deficit that can be covered by central transfer (taken as average of transfer received by a state over the period 2006/07 to 2010/11) is lowest in Punjab. Bottom five states according to this criterion are Punjab, Haryana, Goa, West Bengal and Kerala. Among them proportion of estimated deficit not financed by own tax revenue are also high in West Bengal, Kerala and Punjab. So required public investment expenditure (derived from social welfare maximization rule & given target growth rate) plus historically determined public consumption expenditure indicates that these states need some debt restructuring if growth target is to be met. We have also derived a sharing principle that may be used to transfer resource from centre to the states. Other than transfer received in terms of the sharing rule mentioned, centre may give some debt relief to these states to come out of this debt trap. This will not only help them to meet growth targets but also will raise their future own tax collection and reduce estimated deficit by reducing estimated public consumption expenditure.

4. A Proposed Resource Sharing Rule for Finance Commission and Debt Restructuring

Based on the above table 16, one may calculate a sharing rule based on the lines similar to 13th finance commission report. We can combine the fiscal distance and capacity by calculating the population weighted shares of $\left[\left(\frac{\hat{G}^{*}-\bar{T}}{\bar{T}}\right)*\overline{\left(\frac{T}{\hat{T}}\right)}\right]$ and give it suitable weights. To note that the term $\left[\left(\frac{\hat{G}^{*}-\bar{T}}{\bar{T}}\right)*\overline{\left(\frac{T}{\hat{T}}\right)}\right]$ is the proportion of deficit covered by own tax revenue multiplied by average tax effort variable defined earlier (calculated as a three year moving average). Thus this captures both the so called fiscal discipline as well as tax effort. Thus the formula could be as follows:

$$f_i = A/B, where\ \mathrm{A} = \left[\left(\frac{\hat{G}^* - \bar{T}}{\bar{T}}\right) * \left(\frac{\bar{T}}{\hat{T}}\right)\right]_i, B = \sum_i^{17}\left[\left(\frac{\hat{G}^* - \bar{T}}{\bar{T}}\right) * \left(\frac{\bar{T}}{\hat{T}}\right)\right]_i$$

$$Then\ s_i = \frac{Pop_i^{2011} f_i}{\sum_1^{17} Pop_i^{2011} f_i}$$

Table 17: Proposed Sharing Rules of Central Funds for States for 2012-13

State	Sharing Rule	Rank of State
Andhra Pradesh	0.0505	8
Bihar	0.2617	1
Chattisgarh	0.0077	16
Goa	0.0008	17
Gujarat	0.0276	11
Haryana	0.0155	15
Jharkhand	0.064	4
Karnataka	0.0253	12
Kerala	0.0242	13
Madhya Pradesh	0.0512	7
Maharashtra	0.0369	9
Odisha	0.0626	5
Punjab	0.0207	14
Rajasthan	0.0617	6
Tamil Nadu	0.0332	10
Uttar Pradesh	0.1137	3
West Bengal	0.1427	2

The above calculation is done for the year 2012-13 only. This is because this is the last year for which revised figures of taxes are available and our moving average estimate predicts the value for 2012-13. We did not want to extend it for too long. According to the above table we find that total transfer is to be shared in such a way that Bihar gets highest share, 26.17 percent followed by West Bengal (14.27 percent) and Uttar Pradesh (11.37 percent). Due to high level of per capita private investment it seems though Kerala and Punjab fail to cover required expenditure through own tax collection, in absolute term their estimated deficit is much lower than other states. As a result, much lower share of revenue from centre to these states will help them to satisfy the expenditure requirement to meet growth target, maximize welfare and meet estimated consumption expenditure.

The main caveat to the above calculation is that the target growth rate for the year 2012-13 is the one set by Planning Commission (2012). One may apply this rule and calculate transfer for some more years using the same growth rates of planning commission. The results would change if the target growth rates change. Similarly, if some of the parameters like elasticity of inter-temporal substitution or rate of impatience (the time rate of discount) assume different values. However, ranking would not change, unless the parameters are changed in random fashion or rule of optimization changes. The point to stress once more is the uniqueness of the approach adopted here, which places utmost weight on the growth at the sub-national level keeping welfare as well as tax effort in mind. Thus, need for separate weights for fiscal distance and fiscal indiscipline as incorporated in 13th finance commission report to be incongruous. The assumption of the independence of the two categories in sharing rule is untenable.

The constitution of India has provided higher expenditure responsibilities to the state governments and less revenue raising power to the state governments. It is also said that centre will transfer some of its revenue to the state governments.

In case this sharing rule is to mature, it may not be possible to bear the costs of this from simple revenue sharing of finance commission. This may be done by some amount of debt restructuring so that some states having high interest burden may generate more resources for developmental purposes. One study commissioned for 13th finance commission suggested the following –"If the states agree, then the **Interest Free Debt Relief Fund** may be recommended by the 13th Finance commission. The states are fast moving towards the market for their loan requirements. Therefore, immediate steps are necessary to correct the distortions in expenditure through incentive based policies such that high growth of GSDP is achieved, with a sustainable debt-income ratio in future (Nayak and Rath, 2009, p.113). Following Domar model, Public debt is considered to be sustainable as long as the growth of

income exceeds the interest rate or cost of public borrowings subject to the condition that the primary balance is either positive or zero.

The problem is compounded by the interest payments on accumulated debt, which further erodes the capacity of the states to undertake capital expenditure. As Rangarajan and Srivastava (2004) very succinctly summarises this – "Interest payments add to government's revenue expenditures leaving less of current fiscal deficit for use for government capital expenditure…….. As government capital expenditure on infrastructure and other vital public goods is increased, the growth impulse is positively affected…….RBI (Report on Currency and Finance, 2000-01, 2002) has noted that raising public sector investment to boost aggregate demand in the economy crowds-out both private consumption and investment with no long-lasting impact on output. On the other hand, infrastructure investment by the public sector crowds-in private investment while public investment in manufacturing crowds-out private investment".

In our study, Bihar is a case in point which has fallen into a low level equilibrium trap in the sense that private capital per head in Bihar is very low. In other words, the developmental expenditure of the government in Bihar could not crowd-in private investment for other socio-economic factors. On the other hand the low tax effort there apparently shows actual government expenditure to be too high compared to actual tax collection and tax potential. This creates an odd situation where Bihar's optimal development expenditure does not differ much from the actual. The only way it could demand a high developmental expenditure is the assumption of a much higher growth than envisaged by Planning Commission. But that rests on the assumption of crowding-in of private investment to happen. Bihar needs to increase tax effort significantly as is found in the last section on tax effort and attract more private investment to raise growth. Otherwise a high level of developmental expenditure will not promote growth and any optimality exercise will put Bihar in a precarious predicament. The case of Jharkand appears just the opposite due to the presence of large amount of private capital in its mining and its related manufacturing sectors. Given the growth target which we have adopted from Planning Commission (2012), they are in great need of developmental expenditure of the government. Thus they give an opposite picture to Bihar

Reserve Bank of India did a study (RBI, 2013) on the debt position of the states and its proximate causes. A panel data framework has been used to analyse the improvement in the debt position of 17 non-special category states in terms of state-level fiscal and macroeconomic variables. The panel data analysis was conducted for the pre-debt consolidation phase (1992-93 to 2001-02) and the post-debt

consolidation phase (2002-03 to 2011-12). The post-debt consolidation period was identified based on the introduction of the debt swap scheme (DSS) in 2002-03. While the dependent variable was taken to be incremental debt-GSDP ratio, the chosen explanatory variables were grouped into two categories: (a) states fiscal indicators, *viz.*, own revenue, central government transfers to states, revenue expenditure, capital outlay and net lending; and (b) growth in nominal GSDP as the macroeconomic variable. All the explanatory variables have been taken as a proportion to GSDP. The analytical framework attempts to capture the cross-sectional as well as the time series dimension of the state-level data. The panel was estimated through a fixed effects model, using the generalized least squares regression method with cross section weights.

The study observes the following- "During the pre-debt consolidation phase, it was found that, among the identified variables, states' own revenue, central transfers, revenue expenditure, capital outlay and net lending had a significant impact on state government's debt in the expected directions. The impact of growth in GSDP was, however, statistically insignificant. During the post-debt consolidation phase, the growth in GSDP turned significant, reflecting the positive impact of the high GSDP growth in reducing the debt-GSDP ratio of the states. Among the fiscal variables, states' own revenue, central transfers and revenue expenditure continued to remain significant in the post-debt consolidation phase. It may be noted that the explanatory power of the model came down during the second period as reflected in a lower value of adjusted R squared indicating the presence of other factors. An important factor at play during this period was the central government policy initiatives that helped reduce interest payments and the level of debt (RBI, 2013, pp.76-77)". Our study corroborates this finding through the optimal growth exercise and tax effort calculation.

5. Concluding Remarks

This report has stressed two main issues- one related to tax effort and tax capacity in sub-national category states in India and the second is the integrated nature of resource transfer needs of states vis-à-vis its targeted growth rates and welfare levels. The main findings of the current study are summarized below.

1. The tax effort of states should be reworked in terms of taxable capacity and not GSDP. The taxable capacity leaves out a large portion of unorganized sector manufacturing and trade. The results show substantial difference in some cases.
2. The gap filing approach of finance commission ignores a basic fact that such endeavour would improve own tax collection of states provided development expenditure of states meet some

optimality criterion which captures growth on one hand and welfare on the other. In the process it should also consider the issue raised in point (1) above.

3. The study has tried such an exercise on a pilot basis and the result clearly shows the urgent need to rework the resource sharing rules pursued by such bodies like finance commission. To achieve a sustainable outcome which may reduce deficit of the states without compromising the need for optimum developmental expenditure is worked out for the year 2012-13, since this is the last year for which budget figures of tax etc are available for states across India.
4. The exercise is done for non-special category states since the optimality defined here applies more aptly to such states. However, this may be extended to special category states later too.
5. The important message here is the absolute necessity of meeting the optimal development expenditure of states. Thus, in case resource transfer from centre to states fail to satisfy it (and this looks inevitable from our calculations), either an interest free debt adjustment fund or other kind of debt restructuring may work as supplementary resources. It is expected that proper utilization of such funds for developmental expenditure would accelerate the movement of the states toward the desired growth path, thereby reducing the gap between aggregate government expenditure and revenue in future in a targeted manner.
6. In case, this sharing rule based on an inter-temporal optimality fails, one may investigate the nodes where the model failed. It may be in the assumption or estimation or even in the efficient implementation by the respective states. This should then be accommodated in future such exercises to improve upon the results.

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