Research Retreat Report

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On the Research Retreat Report...

Centre for Training and Research in Public Finance and Policy (CTRPFP) is a recent and unique research programme funded by the Ministry of Finance, Government of India and dealing with issues related to public finance and public policy. Apart from pursuing a wide range of academic and policy related activities (available in the website www.ctrpfp.ac.in) we have been organizing research retreat with local scholars. This is a part of the 'National Conference' and specifically targeted towards local scholars. This is also a capacity building exercise which would enable local scholars from various institutions to discuss their ongoing work (funded or not funded by CTRPFP) related to the general theme of CTRPFP. This volume represents a collection of works-in-progress presented in two research retreats. These are very preliminary drafts and the copyright of these works belongs exclusively to the authors. This report is not a publication.

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Tax effort of Indian States: What explains the underperformance of West Bengal?

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Abstract

This paper seeks to explore the possible determinants of tax effort of Indian states. Our analysis, based on a panel data set of 17 general category states, covering the period 2002-03 to 2011-12, reveals that West Bengal's own tax effort is poor compared to other similar states. Based on an estimated relationship between the state's tax effort and per capita income of Indian states, we find that West Bengal's tax-GSDP ratio remained around 67% of its potential value. Our econometric analysis also suggests that the tax effort of a state can be explained better in terms of the consumption behavior of the state, as major components of own tax revenue of a state are indirect in nature and directly related to consumption rather than income. Analysis based on NSSO commodity wise consumption data indicates that a portion of West Bengal's underperformance in tax collection is due to its consumption pattern. Per capita consumption of some commodities, which are very important from the point of view of tax collection, is unusually lower in West Bengal than the corresponding figures in other similar states. It is, however, not clear whether this is due to informalisation and thereby under- reporting, or genuine consumption behavior.

Introduction

Efficiency of revenue generating performance of a state can be judged by comparing its tax effort with the tax effort of similar levels of government. Tax effort is generally defined as the ratio of actual tax revenue of a government to its taxable capacity. Taxable capacity of a country is usually measured in terms of GDP with an implicit assumption that GDP is the closest possible proxy for the tax base of an economy. This is the most commonly used measure of tax effort for cross country tax comparison. There are many empirical studies[1] which have demonstrated a positive and significant relationship between tax effort (measured in terms of tax-GDP ratio) and level of economic development (measured in terms of per capita income) in a cross country setting. A positive relationship between tax-GDP

[1] See, for example, Pessino and Fenochietto (2010), Lotz. et. al (1967), Le et. al. (2012)

ratio and per capita income is easy to establish given the fact that tax structures in most of the countries are progressive. Some researchers also argue that the demand for government services is income elastic and therefore the share of goods and services provided by the government is expected to rise with income. This also establishes a positive relationship between tax-GDP ratio and per capita income.

As a corollary, in case of states within a country, GSDP can be taken as a proxy for the tax base and therefore the tax effort of a state can be measured in terms of tax to GSDP ratio. In this paper we are interested to explore the nature of relationship between tax-GSDP and level of economic development of a state. Under the existing Indian federal fiscal structure, states' rights to collect taxes are largely confined to indirect taxes, predominantly commodity taxes like sales tax/VAT and other indirect levies. We argue that as most of the taxes collected by a state are indirect in nature, the tax effort of a state is expected to be explained by the consumption behaviour of a state. We have used commodity wise consumption data from NSSO consumption survey rounds to test our hypothesis regarding possible relationship between tax effort and consumption behaviour. Our analysis suggests that tax effort of Indian states can be explained in a better way if we use consumption data rather than income data.

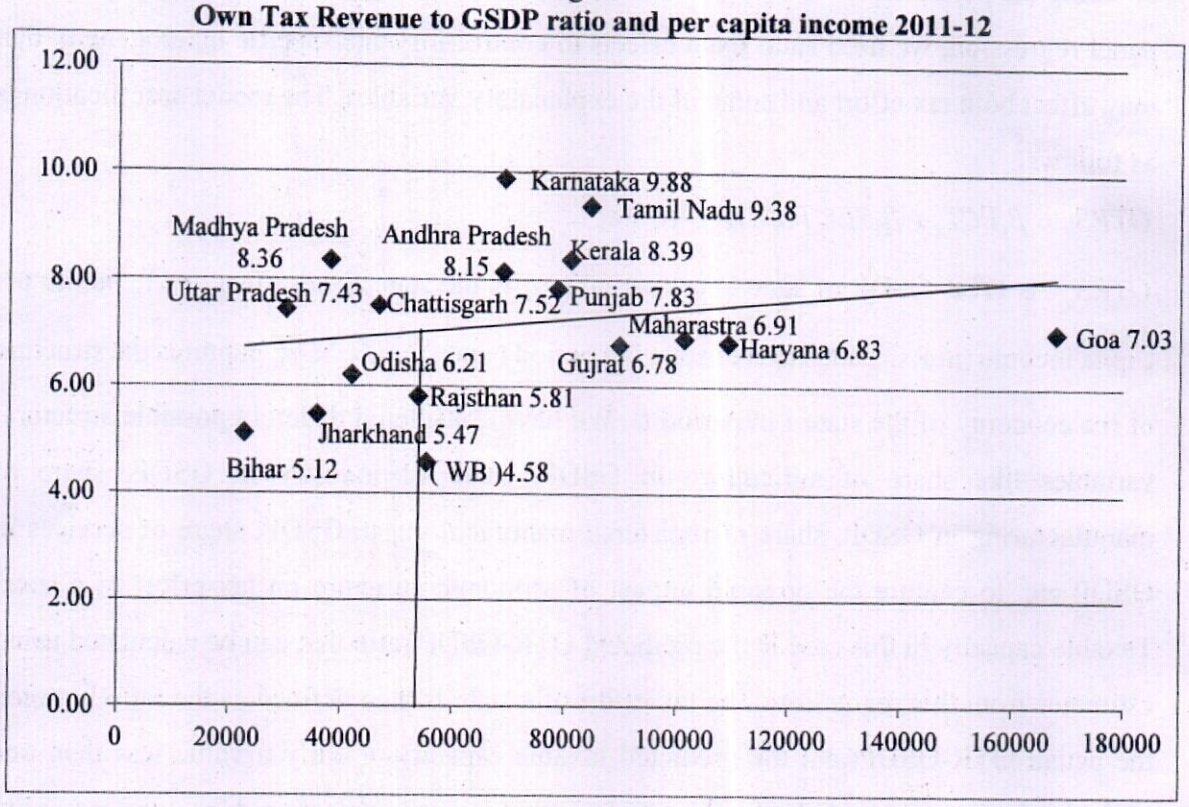
Tax effort and level of economic development

If we directly compare OTR-GSDP of different states of India, we ignore the possible link between the level of economic development (captured in terms of per capita income) and the tax-GSDP ratio. To evaluate the tax revenue generating ability of a state in the right perspective one needs to evaluate them against their taxable capacity. Different states of India are at different levels of economic development and the tax capacity of the 'poorest one' and the 'richest one' cannot be the same. For example OTR-GSDP of the poorest state, Bihar cannot be directly compared with that of the richest state, Goa. Taxable capacity of a state is the maximum amount of tax revenue that a state can collect. The gap between actual tax-GSDP and the potential tax-GSDP measures the tax effort of a state. Figure 1 plots OTR-GSDP of different states against their per capita income, and the scatter diagram indicates a positive relationship between tax-GSDP and level of per capita income. Given the trend line, the vertical distance between the actual OTR-GSDP point and the potential OTR-GSDO

(point on the line) measures the level of tax effort of a state. Any point below the trend line indicates low tax effort and vice versa.

Figure 1

Own Tax Revenue to GSDP ratio and per capita income 2011-12



Source: Authors' calculation based on RBI and CSO data

It is evident that states like Karnataka, Tamil Nadu, Madhya Pradesh, Kerala, Andhra Pradesh and Uttar Pradesh emerge as the best performing states in terms of own tax collection in relation to their tax base. West Bengal, followed by Bihar and Jharkhand are the worst performers in terms of their tax collection in relation to their taxable capacity. Among all the general category states, West Bengal is the worst performer even with a moderate 10th ranking in terms of its per capita income. Despite having a mid-level per capita income and an average growth performance, it is puzzling why the own tax collection is so poor .This prompts us to go deep into the problem and analyze why the OTR-GSDP ratio is so low in West Bengal.

To have a better understanding, we adopt a regression approach to estimate the taxable capacity and tax effort of Indian states. The regression approach incorporates a set of independent variables to explain variation in a state's own tax revenue collection. Predicted tax revenue based on this estimated equation measures the tax capacity of a state. A

comparison of the actual tax revenue of a state with its estimated taxable capacity will give us information about its tax effort. We used a panel data set of 17 general category states covering the period 2002-03 to 2011-12 to estimate taxable capacity of Indian states. In our panel regression, we used state fixed effects to control for state specific heterogeneity that may affect both tax effort and some of the explanatory variables. The model specification is as follows.

$$OTRS_{it} = \beta_1 PCI_{it} + \beta_2 SECTGSDP_{it} + \alpha_i + \varepsilon_{it}$$

$OTRS_{it}$ is OTR-GSDP of state i for period t, α_i is the state fixed effect, PCI_{it} is the per capita income (in Rs. Thousand) of state i in period t and $SECTGSDP_{it}$ captures the structure of the economy of the state i in period t. We have considered different possible structural variables like share of agriculture in GSDP, share of industry in GSDP, share of manufacturing in GSDP, share of registered manufacturing in GSDP, share of services in GSDP etc. to capture the possible impact of economic structure on tax effort of a state. Taxable capacity in this case is the predicted OTR-GSDP ratio that can be calculated using estimates from this regression. The tax effort of a state is then defined as the ratio between the actual OTR-GSDP and the predicted taxable capacity. Clearly a value less than one indicates low tax effort. One should note here that low tax collection does not necessarily imply low tax effort. Only if tax collection is low compared to its potential (predicted collection on the basis of our estimated regression equation), we can say that tax effort is low.

First, we ran a regression with the above specification and found that none of the structural variables are statistically significant. Their inclusion does not significantly improve the model fit. Dropping these variables from our regression specification gave us the following results.

Table 1

Panel data estimation of Own tax revenue/GDSP

	Coefficient	Standard Error
Per Capita Income *(in ₹ thousand)*	**0.00011*** **	**0.00002**
State Fixed Effects		**Yes**
R-Squired		
Within		**0.12**
Between		**0.12**
Overall		**0.11**
Number of States		**14**
Number of Observations		**187**

Note: Significant at 10 per cent.

Our regression results suggest a positive and significant relationship between per capita income and OTR-GSDP. The overall explanatory power of the model however is low with R square at 0.11. Using the estimates of Table IV.II.8 we calculate the tax efforts of Indian states as a ratio between the actual OTR-GSDP to the predicted OTR-GSDP. States and their tax efforts are summarized in Table 2 below.

Table 2

Tax Effort of Indian States

State	Tax Effort (=Actual OTR - GSDP / Predicted GSDP)
Andhra Pradesh	1.12
Bihar	0.71
Chattisgarh	1.08
Goa	0.9
Gujrat	0.96
Haryana	1.03
Jharkhand	0.72
Karnataka	1.38
Kerala	1.15
Madhya Pradesh	1.12
Maharashtra	1.01
Odisha	0.84
Punjab	1.04
Rajasthan	0.97
Tamil Nadu	1.25
Uttar Pradesh	1.01
West Bengal	0.67

Source: Authors' calculation using estimated coefficients from panel regression

Based on our regression results, we can say that states like Karnataka, Tamil Nadu, Madhya Pradesh, Kerala, Andhra Pradesh, Haryana, Chhattisgarh, Punjab and Uttar Pradesh emerge as the best performing states in terms of own tax collection in relation to their tax capacity. West Bengal, followed by Bihar and Jharkhand are the worst performers in terms of their tax effort. In case of West Bengal, this underperformance is maximum as the state's OTR-GSDP is only 67% of its capacity.

An alternative specification: Consumption and tax collection

In a cross country setting, a positive relationship between tax-GDP ratio and per capita income is easy to establish given the fact that tax structures in most of the countries are progressive. Some researchers also argue that the demand for government services is income elastic and therefore the share of goods and services provided by the government is expected to rise with income. This also establishes a positive relationship between tax-GDP ratio and per capita income. Under the existing Indian federal fiscal structure, the states' rights to collect taxes are largely confined to indirect taxes, predominantly commodity taxes like sales tax/VAT and other indirect levies. Own Tax Revenue (OTR) of a state mainly comprises taxes on professions & trades, taxes on property and capital, taxes on commodities and services (including Value Added Tax (VAT), state excise, motor vehicles and passenger tax) and clearly most of them are not directly related to the gross income of a state. Being indirect in nature they are expected to be more closely related to consumption than income. As the major components of own tax revenue of a state are indirect in nature, we don't expect progressivity in their tax structure and this perhaps explains why the overall explanatory power of our estimated regression equation is so low.

We now turn our attention to explore any possible relationship between tax collections of the states and their consumption behaviour. As mentioned earlier, major components of OTR are indirect in nature and are directly related to consumption rather than income. We now analyze the consumption data for West Bengal and other similar states to see whether they can additionally help us to resolve the tax puzzle. We have computed the monthly per capita consumption expenditure (MPCE) of a state from the weighted average of rural and urban MPCE data for seven NSSO consumption survey rounds. We have taken projected rural and urban population data as appropriate weights to calculate combined MPCE of a state. Analyzing the commodity wise consumption data, we have divided the total consumption

into two groups: easy to tax consumption and hard to tax consumption. Most of the non-food items except items like expenditure on education, expenditure on second hand durables, rents, taxes and cesses are included in the taxable consumption group. We then computed the ratio of taxable consumption to total consumption for each general category states and for each NSSO round. We now have a panel of 17 general category states covering seven years of consumption data. In this case our fixed effect regression specification is as follows.

$$OTRS_{it} = \beta_1 TCS_{it} + \alpha_i + \varepsilon_{it}$$

Where TCS_{it} stands for share of taxable consumption in total consumption in state i for year t. Our panel regression results are presented in Table 3 below.

Table 3
Panel estimation of Own tax revenue/GSDP

	Coefficient	**Standard Error**
Share of Taxable Consumption	0.09252***	0.02252
State Fixed Effects		Yes
R-squired		
Within		0.1536
Between		0.6718
Overall		0.5993
Number of States		17
Number of Observations		111

We find a strong positive and significant relationship between taxable consumption share and OTR-GSDP of Indian states. The overall explanatory power of the model (with R-sq = 0.599) is also significantly better than our earlier specification (with R-sq = 0.11). This clearly suggests that consumption behavior explains tax efforts of Indian states better than income data. The ratio of actual tax-GSDP to the estimated tax-GSDP (based on the alternative regression specification) for different states are summarized in Table 4. It is clear that some part of West Bengal's underperformance in tax collection can be explained in terms of its consumption behaviour. However, there are other factors at play which are responsible for the poor tax effort of the state. It is not clear, however, what the other factors behind West Bengal's poor tax effort are. Some researchers have argued that the informal nature of the West Bengal economy is behind the state's poor revenue generation.

Table 4

Tax Effort of Indian States under alternative specification

State	Tax Effort (=Actual OTR - GSDP / Predicted GSDP)
Andhra Pradesh	1.08
Bihar	0.78
Chattisgarh	1.12
Goa	1.03
Gujrat	0.97
Haryana	1.12
Jharkhand	0.73
Karnataka	1.31
Kerala	1.02
Madhya Pradesh	1.07
Maharashtra	0.96
Odisha	0.88
Punjab	0.98
Rajasthan	1
Tamil Nadu	1.19
Uttar Pradesh	0.99
West Bengal	0.71

Source: Authors' calculation using estimated coefficients from panel regression

Over the years West Bengal economy has experienced rapid informalisation of its economic activities. Share of industry, particularly registered manufacturing, has shrunk drastically. Though significant structural changes have taken place for all the states and the national economy away from agriculture to services, most of the other states experienced a moderate rise in the share of industry. In case of West Bengal the share of industry declined consistently over the years. Poor manufacturing performance along with decline in the share of agriculture compelled a vast educated unemployed labour force to set up small businesses depending on their own means. A huge number of the job seekers were absorbed in the informal sector, mostly in retail trading and small transport business. As noted by Sarkar (2006) "People dependent on the informal sector for their livelihood do not always live by the formal laws and norms. Some live illegally on government or railway land, others encroach upon city streets to sell their ware. A third group, owning shops or small business, is exposed to the local thugs because it is too costly to get protection from the formal legal system. All these people need political protection." Chatterjee (2009) terms this as

"managing illegalities". Some researchers argue that political control over these informal businesses has crippled the state tax administration, preventing it from generating tax revenue from these economic activities. Increasing informalisation of the economy possibly resulted in underreporting of activities which are very important determinants of the taxable capacity of a state. As is evident from Table 5, consumption of some important commodities in West Bengal are unusually lower than the corresponding figures in other comparable states, most probably owing to informalisation and thereby underreporting. As noted by Datta (2010), the system of governance in West Bengal, banking on informalisation, managing illegalities and merging the barrier between the state machinery and political management, has been taking its toll on government revenue.

Table 5
Size of the economy and consumption/use of some important commodities

	WB	AP	Rajasthan	Chhattisgarh	Odisha
GSDP current price (2011-12) (in Rs crore)	538209	662592	416755	139515	215900
Per capita income (current price) (2011-12)	55222	68970	53735	46743	41896
Per capita sale of petro products (in kg. 2011-12)	64.9	124.5	126.3	77.5	79.9
No. of registered vehicles (in Lakhs) (2010-11)	32.6	101.9	79.9	27.7	33.4
Per capita electricity consumption (Kwh) (2008-09)	442.5	928.2	747.1	1417.6	775.2

Source: CSO, Ministry of Petroleum and Natural Gas, Road Transport Year Books & Central Electricity Authority, Ministry of Power

References:

Chatterjee, P (2009): "The Coming Crisis of West Bengal", *Economic & Political Weekly*, Vol 44, No 9.

Datta, D (2010): "West Bengal Government Finances: A Critical Look" *Economic & Political Weekly*, Vol 44.

Le, M.T, Moreno-Dodson, B., and Bayraktar, N.(2012): "Tax Capacity and Tax Effort": Extended Cross-Country Analysis from 1994 to 2009 (Washington: World Bank).

Lotz, J., and E. Mors.(1967): "Measuring 'Tax Effort' in Developing Countries", *Staff Papers*, Vol. 14, No. 3, November 1967, pp. 478–99 (Washington: International Monetary Fund).

Pessino, C., and R. Fenochietto(2010): "Determining Countries' Tax Effort," Hacienda Pública Española/Revista de Economía Pública, Vol. 195, pp. 61–68.

Sarkar, A. (2006): "Political Economy of West Bengal", *Economic & Political Weekly,* Vol 41, No 4.

Broader Implications of Labor Market reforms: A General Equilibrium Perspective on India

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Abstract

This paper looks at the broader implications of labor market related reforms beyond the conventional partial equilibrium response, which typically looks at the employment effect in a particular sector. We analyze the impact of such policies on overall industrial and rural employment and the size of the non-farm sector in terms of a standard neo classical general equilibrium model. We argue that such reforms in general would cut back the size of the urban informal sector, but at the cost of falling informal wage and a rise in the rural informal sector. This will mean a decline in the average wage unless there is a massive increase in the size of the urban organized sector. If eventually such reforms give rise to an incentive to accumulate capital, the wage prospect will continue to be bleak. On the other hand any effort to raise the productivity of the unorganized manufacturing sector will always increase employment in the organized manufacturing and the average wage rate.

Synopsis

It is well known and well argued in the literature in general that if firms are not allowed to enjoy the flexibility of hiring and firing labor, employment, entrepreneurship and investment will be discouraged. Thus the concern for protecting employment will be frustrated with a negative impact on employment. This is undoubtedly Economics 101. India has always been a case in point advocating rigid labor laws and regulations. Very recently the new Government at the Centre is seriously moving towards a flexible labor market regime definitely to the satisfaction of producers and entrepreneurs. This is one of the contexts, which motivate the paper. However, a broader question is to what extent such a policy can help the economy at large which is characterized by the presence of large unorganized manufacturing sector, agriculture and rural non farm sector. Is it likely to benefit the unskilled working class in general? Does it allow rural people to move out in the industrial sector with productive employment, an age old concern of the development economists stemming from the observations of Arthir Lewis (1951) and G. Myrdal (1957)? One could think of the short run effect of such policies which definitely raises the return to capital and in the longer run may even increase the rate of accumulation of capital. To what extent will that help an average worker? Answering these questions constitutes another motivation of this paper. While it is important to go for easier hire and fire policies that would encourage entrepreneurship and investment, it is also important to check what this kind of policies has in store for the economy at large.

We have five sectors in an economy, namely, agriculture, rural non-farm sector, formal and informal manufacturing sectors and the skilled service sector. Agriculture uses land and labor, non-farm sector uses land, labor and capital, and the informal manufacturing uses labor and capital. The production function for the formal manufacturing is same as that of the informal manufacturing with the formal wage fixed through unionized bargaining. Since the service sector uses skilled workers and capital, unskilled workers may find work in all sectors except in the service sector. Following Marjit (2003) and Marjit and Kar (2007, 2011), Carruth and Oswald (1981), Agenor and Montiel (2008), etc., we assume quite realistically, that all unskilled workers wish to work in the high union-negotiated minimum wage in the formal manufacturing sector, but due to scarcity of jobs available only to a limited number of potential workers, the rest of the workers get absorbed in the rural and urban informal sector.

Except for the non-farm sector which produces a local good consumed by the rural people, all other goods are traded in the world market and by the small country assumptions, there is no price variation.

Markets are competitive and we have CRS production functions. However, one must remember that many simplifying assumption are needed to build a proper conceptual model to identify various mechanisms at work. Such mechanisms will nonetheless exist, no matter what the exact specifications of the model are. The competitive conditions and the basic rules for allocating resources will remain invariant. The price equations for agriculture (commodity 1), non-farm sector (commodity 2, non-traded and needs a demand supply condition to determine equilibrium), informal manufacturing (commodity 3) and formal manufacturing (commodity 4) and services (commodity 5) are given by:

$$wa_{L1} + Ra_{T1} = P_1 \tag{1}$$

$$wa_{L2} + Ra_{T2} + ra_{K2} = P_2 \tag{2}$$

$$wa_{L3} + ra_{K3} = P_3 \tag{3}$$

$$\bar{w}a_{L4} + ra_{K4} = P_4 \tag{4}$$

$$w_S a_{S5} + ra_{K5} = P_5 \tag{5}$$

On the other hand, the full-employment conditions for unskilled labor (L, wage w), Capital (K, return r) and Land (T, return R) are given by:

$$a_{T1}X_1 + a_{T2}X_2 = T \tag{6}$$

$$a_{L1}X_1 + a_{L2}X_2 + a_{L3}X_3 + a_{L4}X_4 = L \tag{7}$$

$$a_{K2}X_2 + a_{K3}X_3 + a_{K4}X_4 = K - a_{K5}X_5\, a_{k_2} \qquad (8)$$

and for the skilled workers (S),

$$a_{S5}X_5 = S \qquad (9)$$

Demand and supply for X_2 is given by the α amount of income spent by those in the rural sector on commodity X_2.

$$\alpha(P_1X_1 + P_2X_2) = P_2X_2 \qquad (10)$$

With the help of this structure, we develop an interesting connection between various pivotal sectors of a modern small open economy, where the non-formal sector and the rural sector coexists with urban manufacturing sector and the booming service sector. For a large number of countries in Asia, Latin America and Africa, this economy-wide structure appropriately captures the length and breadth of economic activities. In some of these countries, the weight is still more on rural employment, for agricultural and non-farm, while in some other, the freer mobility of workers between rural and urban regions have opened the floodgate of informal activities in cities and fringes.

It is important to understand that the improvement of productivity among rural workers does not come without the concerns for the urban workers. In fact, the improvement in rural productivity releases the excess capacity of labor from the agricultural and non-farm sector, which somehow employs a large number of workers, and unless the urban manufacturing sector grows at a commensurate rate, the outcome is overcrowding in the urban informal sector. It has further consequences for the average unskilled wage and the well being of workers in general. A large informal sector, where the wage is freely determined according to the inflow and outflow of unskilled workers, is likely to depress the average unskilled wage in an economy. In addition, substantial growth of the service sector at the cost of the traditional manufacturing sector also implies that capital will be drawn into the booming activities and shall lead to contraction of unskilled manufacturing sectors. Once again, the informal sector may increase in size owing to the negative impact it has on unskilled manufacturing. However, we also discussed a possibility where some unskilled workers might acquire skill simultaneously lowering the stock of unskilled workers in a population growth-wise static economy, and the net effect might depend on how intensively the unskilled labor and the skilled labor are being used in respective sectors. That the service sector uses skilled labor as against homogeneous labor (but with a unionized wage in the urban manufacturing) distributed in all other sectors is also a crucial feature of such general equilibrium relations that also capture important implications for the owners of both capitalists and owners of land. These results principally establishing the rural-to-urban migration patterns in the tradition of Arthur Lewis and later Richard

Harris and Michael Todaro, will see a turnaround if the country implements the labor market reform. The easier employment policies in the industrial sphere might only reallocate labor from the urban informal and urban formal (unskilled) sectors to the formal manufacturing. The easier employment policies may leave the rural sector untouched, principally because the low productivity surplus labor may have already been stationed in the urban sector. In a dynamic sense, this might nonetheless perpetuate rural-urban migration and such ideas may be taken up for analysis in future.

References

Acharyaa, R and S. Kar (2014), *International Trade and Economic Development*, Clarendon: Oxford University Press.

Agénor, P & P. J. Montiel (2008): *Development Macroeconomics*, Third Edition, NJ: Princeton University Press.

Beladi, H, S. Kar and S. Marjit (2013), Emigration, Finite Changes and Wage Inequality, *Economics and Politics,* Volume 25, No. 1, 61-71

Beladi, Hamid & Marjit, Sugata & Broll, Udo, (2011). "Capital mobility, skill formation and polarization," *Economic Modelling*, vol. 28(4), pages 1902-1906.

Beladi, Hamid & Marjit, Sugata & Weiner, Kenneth, (2011). "An analysis of the demand for skill in a growing economy," *Economic Modelling*, vol. 28(4), pages 1471-1474.

Carruth, A. and A. J. Oswald (1981), The Determination of Union and Non-union Wage Rates, *European Economic Review*, Vol. 16, *2/3,* pp. 285–302.

Chandra, Vandana & Khan, M Ali, (1993). "Foreign Investment in the Presence of an Informal Sector," *Economica*, vol. 60(237), pages 79-103.

Chao, Chi-Chur & Yu, Eden, (1992). "Imported materials prices, urban unemployment, and welfare," *International Review of Economics & Finance*, vol. 1(2), pages 121-132.

Chaudhuri, Sarbajit, (2000). "Rural-Urban Migration, the Informal Sector, Urban Unemployment, and Development Policies: A Theoretical Analysis," *Review of Development Economics*, vol. 4(3), pages 353-64.

Chaudhuri, S and U. Mukhopadhyay (2010), *Revisiting the Informal Sector: A General Equilibrium Approach*, New Delhi: Springer.

Fields, Gary S (1975), Rural-Urban Migration, Urban Unemployment and Underemployment and Job Search Activity in LDCs, *Journal of Development Economics,* 2, 2, 16 Fields 5-88.

Gupta, Manash Ranjan, (1993). "Rural-urban migation, informal sector and development policies A theoretical analysis," *Journal of Development Economics*, vol. 41(1), pages 137-151.

Jones, R. (1965), The Structure of Simple General Equilibrium Models, *Journal of Political Economy*, Vol. 73, pp. 557–572.

Jones, Ronald (1971), A Three-Factor Model in Theory, Trade, and History, Ch. 1 in J. Bhagwati, R. Jones, R. Mundell and J. Vanek (eds.), Trade, Balance of Payments and Growth,Papers in International Economics in Honor ofCharles P. Kindleberger, Amsterdam: North-Holland, pp. 3–21.

Jones, R.W. and S. Marjit (1992), *International trade and endogenous production structure.* In: W. Neuefeind, & R Reizman (Eds.), Economic theory and international trade: Essays in honour of J. Trout Rader, Springer.

Kar, S and S. Marjit (2001), *Informal Sector in General Equilibrium: Welfare Effects of Trade Policy Reforms,* International Review of Economics and Finance, 10, 289-300.

Khan, M. Ali, (1980). "The Harris-Todaro hypothesis and the Heckscher-Ohlin-Samuelson trade model : A synthesis," *Journal of International Economics*, vol. 10(4), pages 527-547.

Marjit, S (2008), *International Trade and Economic Development: Essays in Theory and Policy*, Oxford University Press, New Delhi.

Marjit, S. (2003), Economic reform and Informal wage – A General Equilibrium Analysis, *Journal of Development Economics*, Volume 72(1), pp 371-378.

Marjit, S. and R. Acharyya (2003), *International trade, wage inequality and the developing economy. A General Equilibrium Approach.* Research Monograph. Physica/Springer Verlag, Heidelberg, New York

Marjit, S and S. Kar (2014), International Capital Flow, Vanishing Industries and Two-sided Wage Inequality, *Pacific Economic Review*, 18, 5, 574-583, Wiley.

Marjit, S and S. Kar (2012), Firm Heterogeneity, Informal Wage and Good Governance, *Review of Development Economics*, 16, 4, 527-539.

Marjit, S and S. Kar (2011), *The Outsiders: Economic Reform and Informal Labour in a Developing Economy*, New Delhi, London: Oxford University Press.

Marjit, S., S. Kar and R. Acharyaa (2007), Agricultural Prospects and Informal Wage in General Equilibrium, *Economic Modelling*, 24, 3, 380-385.

Myrdal, G (1957), *Economic Theory and Underdeveloped Regions*, Gerald Duckworth.

Expected Revenue Comparison between Single Unified and Sequential Auctions

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1. Introduction

Suppose a seller has multiple units of a commodity. Each unit is identical to the others. The seller wants to sell all the units she has using the method of auction. Each of the bidders in the auction has single unit demand. So none of the bidders will place a positive bid for more than one unit of the commodity. The seller can sell the units either by a single unified auction, or by a sequential auction. By a single unified auction, we mean that all the units will be sold in a single stage. By a sequential auction we mean that there will be as many stages as the number of units. One unit will be sold at each stage. Our objective here is to compare the expected revenue that the seller will obtain from each of the auction formats. In this paper we first compare them when bidders' valuations are distributed uniformly over the interval $[0,1]$. Next we consider a general distribution function of bidders' valuations, but will assume that the seller has only two units of the commodity.

It is important to note here that even in single unified or sequential auctions, there are many different auction formats available. For example, "the most standard sealed-bid formats for single stage multi-unit auctions are the discriminatory or pay-your-bid auction, the uniform price auction and the Vickrey auction". However, revenue equivalence theorem dictates that for a class of auction formats the expected revenue of the seller is the same. We will argue later that for our framework revenue equivalence theorem holds.

Revenue equivalence for single stage multi-unit auctions has been established by many authors. First Krishna and Perry (1998) showed that revenue equivalence holds. Later Klemperer (2004) proved that revenue equivalence holds with single unit demand under SIPV[2] framework.

Milgrom and Weber (2000) derived equilibria of sequential auctions. Krishna(2010) showed that for single-unit demand, the sequential first and second price sealed bid auctions are revenue equivalent. Chattopadhyay and Chatterjee (2011) established that all sequential auctions involving single-unit demand and risk neutral bidders,under SIPV framework, are revenue equivalent if the bidding strategies are increasing in valuations.

[2] Symmetric Independent Private Values

Fatima, Wooldridge and Jennings (2005), also compare the expected revenues from simultaneous auctions to that from sequential auctions. They study the sequential auctions for the general case where both private and common value elements are present. Their results show that even if the common and private values are distributed identically across all objects, the selling price can decline for the later auctions.

2. Model

Here we formally introduce our model. We assume that there is a single seller, who has $S \geq 2$ indivisible units of a commodity. The valuations for each of the units to the seller is normalized to zero. There are $N > S$ number of bidders. Each buyer has a demand for only one unit of that commodity. We assume SIPV framework. The private value for bidder i is $X^i = \left(X_1^i, 0, \cdots, 0\right)$. For simplicity we denote X_1^i by X_i. Each X_i is independently and identically distributed on some interval $[0, \omega]$ according to the distribution function F. It is assumed that F admits a continuous density f where $f \equiv F'$ and has full support. Bidder i knows the realization x_i of X_i and only that the other bidders' values are independently distributed according to F. Bidders are risk neutral - they seek to maximize their expected profits. All components of the model other than the realized values are assumed to be commonly known to all bidders. We further assume that the bidders have no budget constraints. Finally we assume that all the auctions are first price auction i.e. the highest bidder wins and pays her own bid. We are interested in symmetric and increasing equilibrium bidding strategies. Let us assume that the bid function of bidder i in stage j is β_{ij}.

2.1 Single Unified Auction

In the given context, any bidder can expect to win if her bid is among the highest S bids. In other words, any bidder i can expect. Suppose a bidder i whose value to get one unit of the concerned object if his bid is higher than the lowest $(N-S)$ bids. Since this is a single stage auction we denote β_{ij} by β_i for simplicity. So bidder i wins the auction if her bid is higher than the $(S+1)^{th}$ highest bid. That is her valuation is higher than the $(S+1)^{th}$ valuation. The probability of this is

$$G_S(x_i) = \sum_{s=1}^{S} {}^{N-1}C_{s-1} F(y)^{N-s} (1-F(y))^{s-1}$$

This is the distribution function of $N-S$ highest order statistics. The density function is given by

$$g_s(x_i) = \frac{(N-1)!}{(N-S-1)!(S-1)!} F(y)^{N-S-1} (1-F(y))^{S-1} f(y)$$

Lemma 2.1 (Equilibrium Bid) *At equilibrium the bid function of the i^{th} bidder is given by*

$$\beta(x_i)=\frac{1}{G_S(x_i)}\int_0^{x_i} y g_S(y)dy$$

Therefore the expected payment of the bidder i is

$$E[m(X_i)]=\int_0^{\omega}\int_0^{x_i} y g_S(y)dy f(x_i)dx_i$$

There are N bidders. So the expected revenue of the seller is

$$E[R^{SI}]=N\int_0^{\omega}\int_0^{x_i} y g_S(y)dy f(x_i)dx_i$$

2.2 Sequential Auction

In case of a sequential auction with S units offered for sale, the symmetric equilibrium will consist of S functions $(\beta_1,\beta_2,\cdots,\beta_S)$ denoting the bidding strategies in the first, second and so on till the S^{th} period. Since we are interested in equilibria that are sequentially rational - that is, equilibria with the property that following any outcome of the first-period auction, the strategies in the second period form an equilibrium; following any outcome of the second-period auction, the strategies in the third period form an equilibrium and so on; finally, following any outcome of the $(S-1)^{th}$ period auction, the strategies in the S^{th} period form an equilibrium. We begin with the S^{th} period. The equilibrium bid functions for bidder i are as follows:

Lemma 2.2 (Equilibrium Bid in S^{th} Period)

$$\beta_S(x_i)=\frac{1}{F(x_i)^{N-S}}\int_0^{x_i} y dF(y)^{N-S}$$

Lemma 2.3 (Equilibrium Bid in K^{th} Period where $K<S$)

$$\beta_K(x_i)=\frac{1}{F(x_i)^{N-K}}\int_0^{x_i} \beta_{K+1}(y)dF(y)^{N-K}$$

So the expected revenue to the seller is

$$E[R^{SE}] = N\int_0^{\omega} F(x)^{N-1}\beta_1(x)dx + (N-1)\int_0^{\omega}\int_0^{Y_1}\left(\frac{F(x)}{F(Y_1)}\right)^{N-2}\beta_2(x)dx g_1(Y_1)dY_1$$

$$+\cdots+$$

$$+(N-S+1)\int_0^{\omega}\cdots\int_0^{Y_{S-1}}\left(\frac{F(x)}{F(Y_{S-1})}\right)^{N-S}\beta_S(x)dx\cdots g_1(Y_1)dY_1$$

2.3 Comparison

Our objective here to compare $E[R^{SI}]$ and $E[R^{SE}]$ under two different conditions.

Case 1 ($X_i \in U[0,1]$)

Lemma 2.4

$$E[R^{SI}] = \frac{S(N-S)}{N+1}$$

Lemma 2.5

$$E[R^{SE}] = N\int_0^{\omega} x^{N-1}\beta_1(x)dx + (N-1)\int_0^{\omega}\int_0^{Y_1}\left(\frac{x}{Y_1}\right)^{N-2}\beta_2(x)dx g_1(Y_1)dY_1$$

$$+\cdots+$$

$$+(N-S+1)\int_0^{\omega}\cdots\int_0^{Y_{S-1}}\left(\frac{x}{Y_{S-1}}\right)^{N-S}\beta_S(x)dx\cdots g_1(Y_1)dY_1$$

Theorem 2.6 (Expected revenue comparison)

$$E[R^{SI}] > E[R^{SE}]$$

Case 2 ($S=2$)

Lemma 2.7

$$E[R^{SI}] = N\int_0^{\omega}\int_0^{x} y dF(y)^{N-1}dF(x) + N\int_0^{\omega}\int_0^{x} y d[(N-1)F(y)^{N-2}(1-F(y))]dF(x)$$

Lemma 2.8

$$E[R^{SE}] = N\int_0^{\omega}\int_0^{x} y dF(y)^{N-1}dF(x)$$

$$+N(N-1)\int_0^{\omega}\int_0^{y}\int_0^{x}F(v)^{N-2}\,dv\,d(1-F(x))dF(y)$$

$$+(N-1)\int_0^{\omega}\int_0^{y}\int_0^{x}vdF(v)^{N-2}\,dF(x)dF(y)^{N-1}$$

Theorem 2.9 (Expected revenue comparison)

$$E[R^{SI}] > E[R^{SE}]$$

3. Conclusion

We compare the expected revenue of a single unified auction to that of a sequential auction. Our results show that if the valuations of the bidders are distributed uniformly over the interval then it is better for the seller to design a single unified auction. Also if the seller has only two units of the commodity the expected revenue from single unified auction is greater than that of sequential auctions irrespective of the distribution function.

References

Chattopadhyay, S. and R. Chatterjee (2012): "Revenue Equivalence in Sequential Auctions", Economics Bulletin , Vol.32, No.2, pp.1272-1281.

Hausch, D.B.(1986): "Multi-Object Auctions: Sequential vs. Simultaneous Sales", Management Science, 32(2), 1599-1610.

Klemperer, P. (2004): "Auctions: Theory and Practice", Princeton University Press, Princeton, USA.

Krishna, V. (2010): "Auction Theory", Academic Press, California, USA.

Krishna, V. and M. Perry (1998): "Efficient Mechanism Design", mimeo, Penn State University, April.

Milgrom, P. and R. J. Weber (1982): "A Theory of Auctions and Competitive Bidding, II", in P. Klemperer ed., "The Economic Theory of Auctions", Cheltenham, UK: Edward Elgar.

Weber, R.J.(1983): "Multiple Object Auctions", in R. Engelbrecht-Wiggans, R. Shubik and R. Stark (eds.), "Auctions, Bidding and Contracts: Uses and Theory", New York, NY: New York university Press, 165-191.

Strategic Litigation-A Study on Sales tax in West Bengal

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Introduction:

It is well recognized by many that growth related policies of the government , in particular those related to the creation and maintenance of public good , may come in the way of individual or groups to the extent such policies adversely affect their own economic interests. In a democracy such a conflict finds expression in terms of litigations against the government in courts of law. Such litigations delay the process of implementation of just policies and finally create an adverse impact on growth. However, it is intrinsically difficult to quantify such impact since there are many and varied areas where such delay can happen.

In this context a study was undertaken to work with a problem where litigations against tax provisions delay collection of revenues and such delays often strategically caused. The focus of the study has been tax litigations in state of West Bengal, filed against the state tax authorities.An attempt has been made to infer first, what is the probability that a tax litigation is strategic or genuine from the outcomes of litigations and second to what extent it effectively hurts collection of revenues. The causes for such dispute might appear to be because appropriate tax not properly is not imposed or there is always an incentive to expect future gains out of dispute.

The new state government, after uninterrupted rule of 34 years by the last regime, has initiated certain reforms and raised tax collection by more than 25% in the first year of their existence. The study might examine if further reforms are needed to increase the rate of revenue generation.

In general litigations as a strategic devise may be important on their own . But when it hurts the process of implementation of policies, it affects the society at large. In the proposed context we can try to quantitatively estimate its impact.

The study would combine both theoretical and empirical research. A theoretical model would be developed to elucidate the concept. Data on disputes would be collected from the Government sources and legal expert should be consulted on such matters. A survey will be conducted to understand the perception of the various types of taxpayers regarding payment of taxes and the hidden strategies (if any).Government officials (including retired officials and tax lawyers) would also be interviewed for the purpose. We propose a pilot study initially and plan to take up broad based studies subsequently.

The study tries to combine both theoretical and empirical research. A theoretical model would be developed to elucidate the concept. Data on disputes have been collected from the various sources including files of reputed tax lawayers. The study is pilot in nature

Subsequently a survey is planned to understand the perception of the various types of taxpayers regarding payment of taxes and the hidden strategies (if any).Government officials (including retired officials and tax lawyers) would also be interviewed for the purpose in due course.

Some studies has been done in United States on 'Sham Litigation'.Christopher Klein(1989) of the Bureau of Economics in the Staff Report to Federal commission has explained the context to some extent. These studies have aimed at understanding the corporate disputes on patents or other anti-competitive strategies. However our study to observe the loss of the government through strategic behaviour of the tax payer might be novel.

There have been some studies undertaken in the domain of law and Economics . Whiteh (2013 has pointed out issues relating to tax disputes. OECD cross country studies have indicated the incidence of tax litigation. However, micro studies have been few.

Objective of the Study: The objective of the study is to understand the process of strategic litigation across various sizes of companies. Attempts have been made to estimate the gains of the companies and loss of Government through such litigation. Some measures to reduce the gain of the client and the loss of the Government has been suggested.

Data Collection

This is not a standard type of data collection

Major source of the data were the Old files of three reputed advocates containing returns of last 10 years.Relevant database was constructed using the available files.

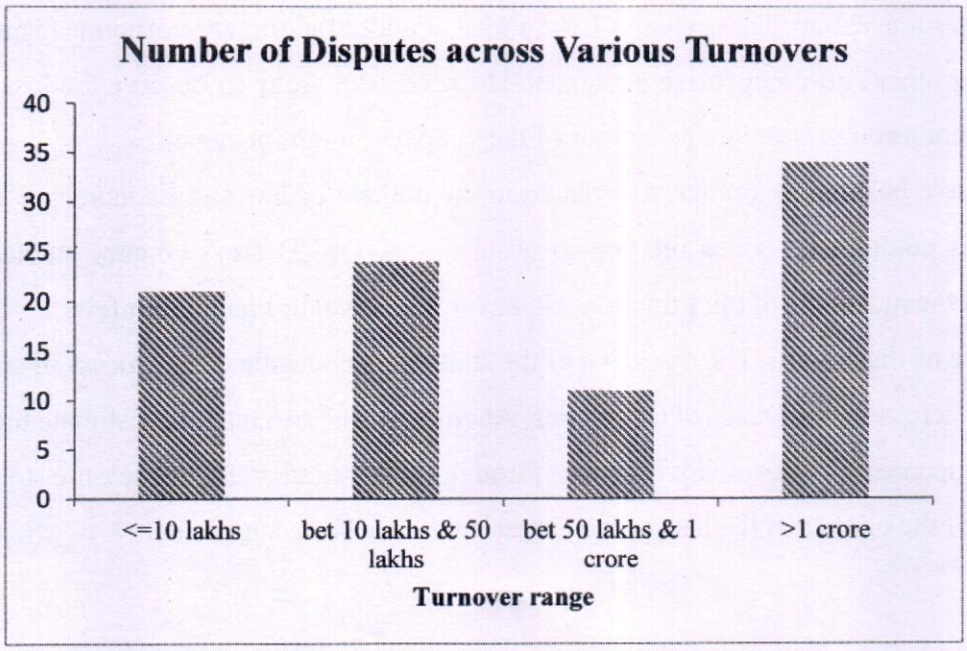
Companies whose dispute has remained unsettled till date, cases where company has closed down in the middle and companies that did not keep any relation with respective advocate have been excluded.

Findings:

It has been observed looking at the files of advocates that a significant section of tax payers (about 30-40%) opt to go for disputes and about 70-80% out of them have been gainers on an average. The proportion of dispute cases increase with turnover implying that large firms opt for dispute more than small. Very large firms (corporates) not covered under our study. In all 90 firms has been studied.

Table -1

Turnover Range	Number of Disputes
<=10 lakhs	21
bet 10 lakhs & 50 lakhs	24
bet 50 lakhs & 1 crore	11
>1 crore	34



Existing practice of tax payment

Government collects a portion of sales tax (undisputed) and allows the rest to be retained by the tax payer till it is settled. At the end of the dispute Government collects the pending tax after giving appropriate relief. The tax payers have the option of investing the disputed amount in the informal credit market and earn huge revenue (with current rate of 2.5% rate of interest per month).The system has proved very inefficient as the Government incurs a huge loss.

Stages of Disputes:

Currently there are five stages of disputes. The description of the stages of disputes and the incidence are mentioned below

Stages of Dispute: The stages of dispute is mentioned in the table.

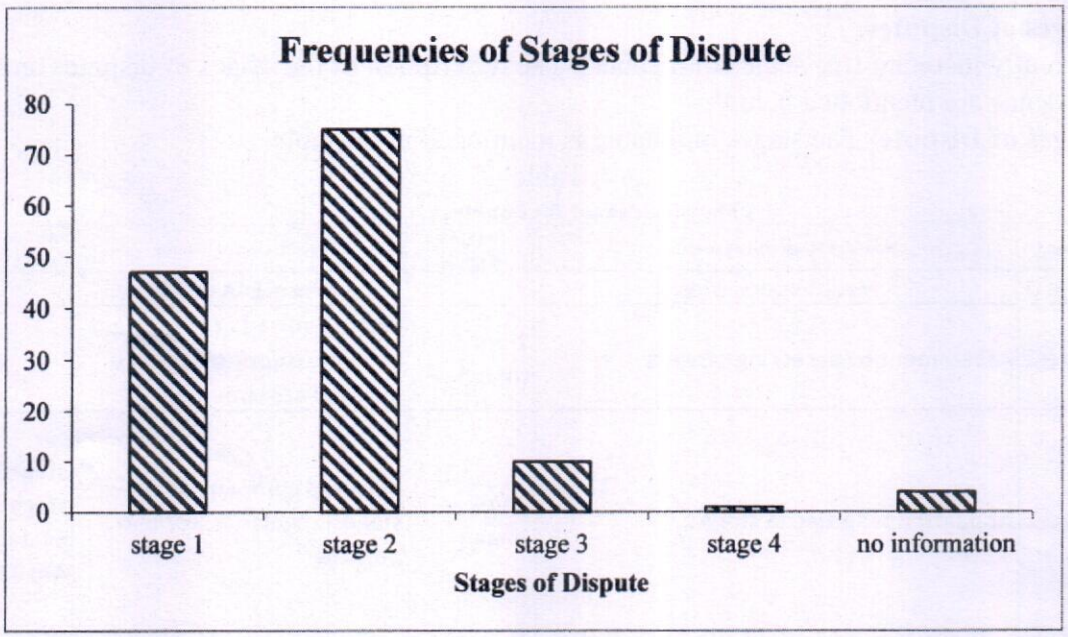
Table -2

Different stages of Tax Disputes :

Stages	Name of Stage and description	Time for disposal	description of dispute	no in our data base	Type of forms
stage 0	return submission		Form14A or 16		14
Stage-1	Assessment by assessing officers	2 yrs (max.)	dispute solved at assesment by negotiation--treated as deemed assesment	49	68
Stage-2	Appeal if not settled in stage 1	1 yrs (max.)	disputed company at later stage-- regular assesment process	stage2+ stage 3+stage 4=103	
Stage-3	if not settled in stage 2: Appealate Board/ Tribunal (W.B.Commercial Taxes Appealate & Revisional Board	No fixed period	Sometimes depending on the merit of the cases Appelate board set aside and remand to assessing authority for modification(i.e. reassessment) & confirmation.		
Stage-4	W.B. Taxation Tribunal/ Super Tribunal (equivalent to High Court)	No fixed period			
Stage-5	[If not resolved case is sent to higher forum i.e. **Supreme court**.When dispute arises with respect to *Law-point* (i.e. wrong imposition of tax-rate, wrong definition of product which is non-taxable goods) it goes to supreme court.	No fixed period			

Table-3

Stages of Dispute	Frequencies
Stage 1	47
Stage 2	75
Stage 3	10
Stage 4	1
No Information	4

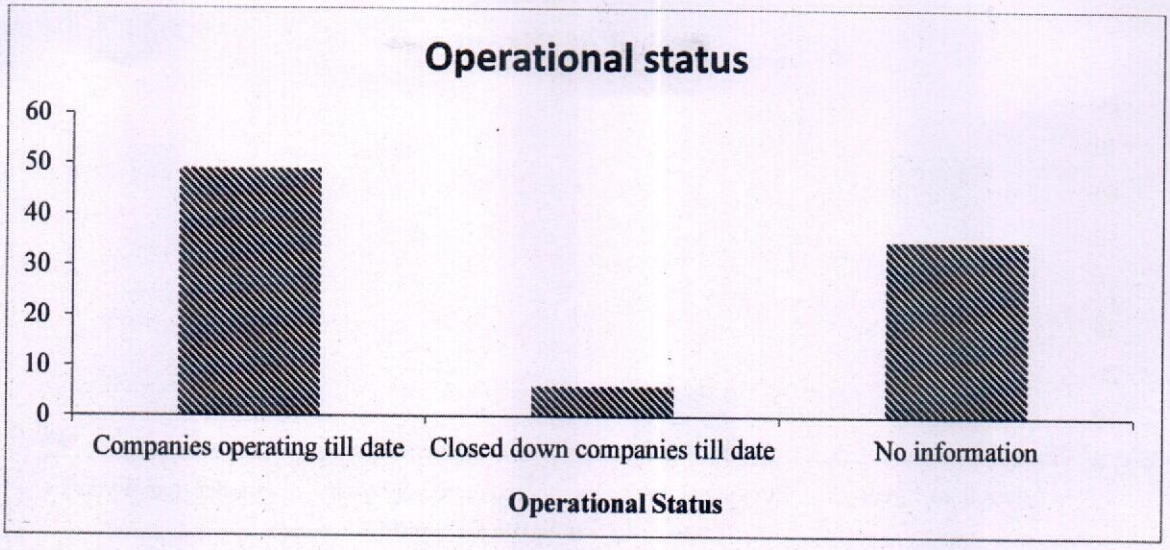


Current operational status of the firms:

Since the data has been collected only from the files of advocates, there were no way to check what happened to the companies who did not turn up in subsequent years. From the data it is evident that six out of 55 companies have closed down their business after the dispute.

Table-4

Disputed companies	Operational status
Companies operating till date	49
Closed down companies till date	6
No information	35

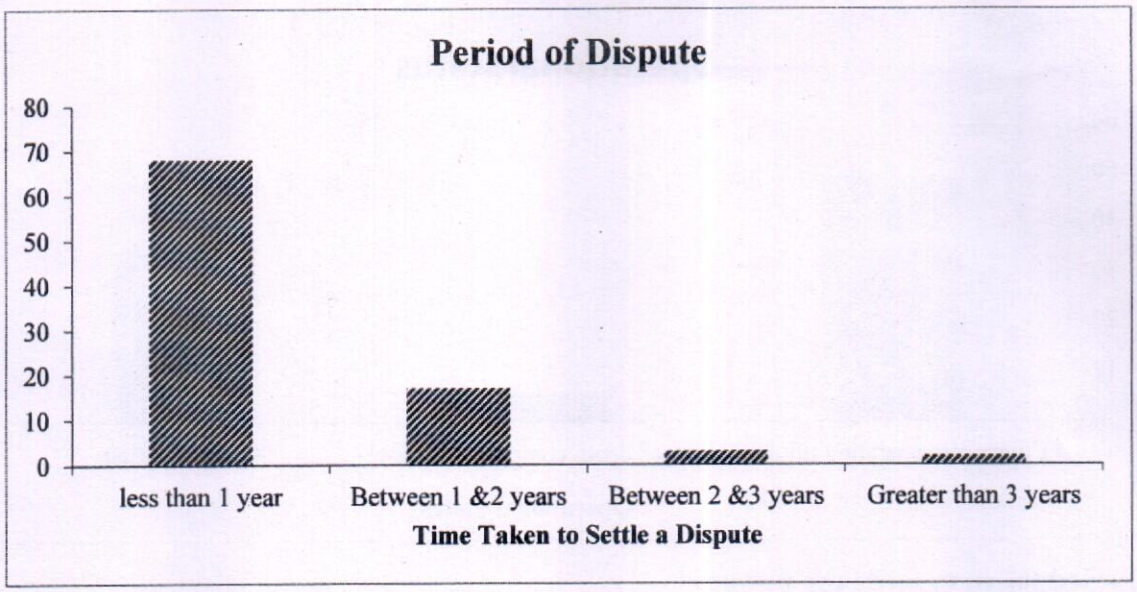


Period taken to settle the dispute

It is observed that most of the firms solves the disputes within an year through repeated negotiations.

Table-5

t	Period of Dispute
less than 1 year	68
Between 1 &2 years	17
Between 2 &3 years	3
Greater than 3 years	2



Suggested Models to estimate gains of clients and losses of Government :

Existing Model

- **Model 1 (in this we are incorporating tax refund at the end of the dispute i.e relief and cost are deducted in the end period or after the case is settled (like case on contract))**
- x= amount assessed by the tax authority
- x_1 = amount paid by the client in period 0 or the upfront payment
- $x - x_1$ =disputed amount
- c= transaction cost
- x_2= amount paid by the client at the end of the period of dispute
- r_1= informal rate of interest (30%)
- r_2=formal rate of interest (12%)
- z= tax relief
- t= time period taken to solve the case

Client's gain:

Client's gain $=(x-x_1)*(1+r_1)\ ^t - c - x_2$

= {disputed amount}*(1+ informal rate of interest) ^ (no of years it takes to solve the case) – negotiation cost – tax paid during settlement

- We can also write **$x_2=(x-x_1)-z$**

$=(x-x_1)*(1+r_1)\ ^t -c -(x-x_1) +z$

$=(x-x_1)*\{(1+r_1)\ ^t -1\} -c +z$ ---------- (1)

Equation 1 shows that client gain in model 1.

Government's gain:

- Government's gain $=x_1(1+r_2)\ ^t + x_2$

= {upfront payment made by the client}(1+ formal rate of interest)^(no of years it takes to solve the case) + tax paid during settlement

- Replacing x2 as above we get,

$x_1(1+r_2)\ ^ t + \{(x-x_1)-z\}$

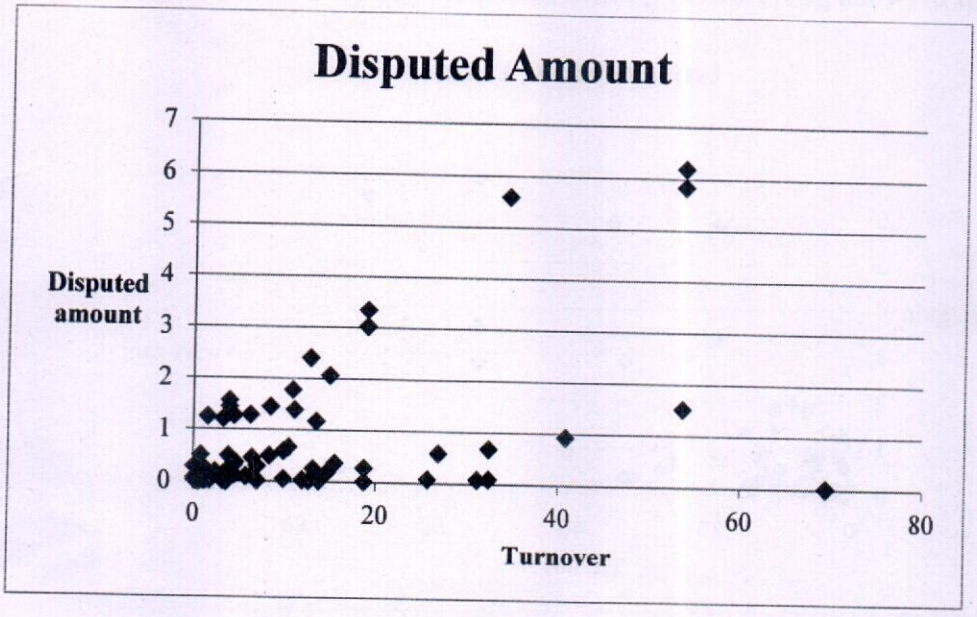
$=x_1(1+r_2)\ ^t - z + x - x_1$

$=x+ x_1\{(1+r_2)\ ^t-1\} -z$ ---------- (2)

Equation 2 shows the government's gain or loss.

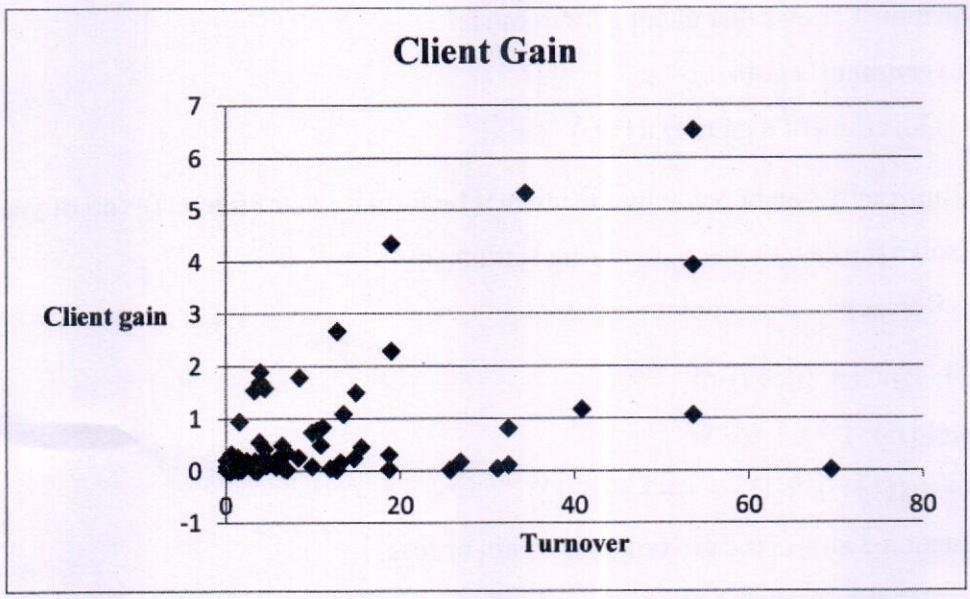
The graph below explains the relationship between different variables.

a) Relationship between disputed amount and turnover



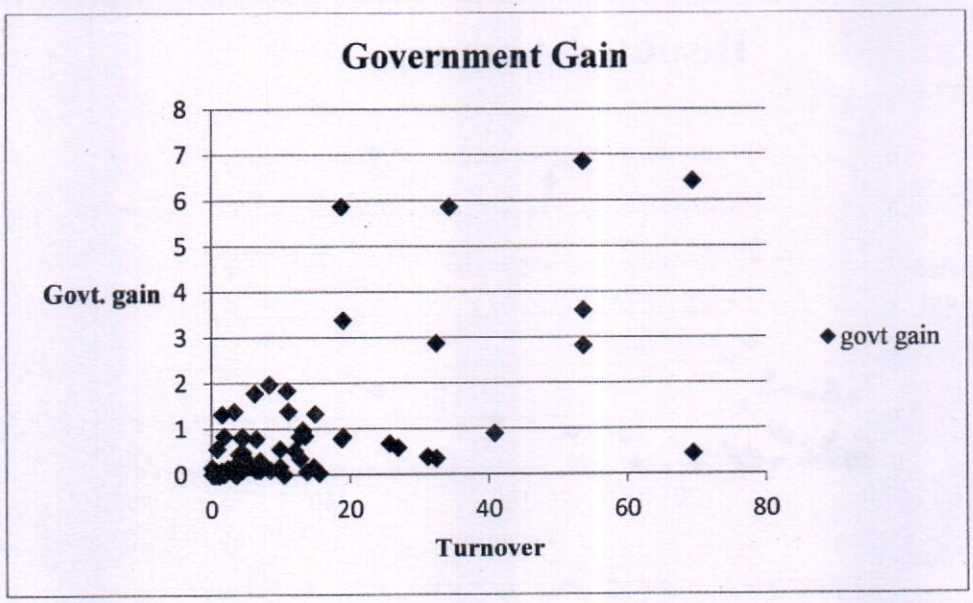
Looking at the scatter plot we can infer that higher the turnover higher would be the disputed amount. We observe the same in the frequency graph classifying the frequency of the firms across various turnovers.

b) Relationship between client gain in the existing model and turnover



A positive relationship between client gain and turnover is observed

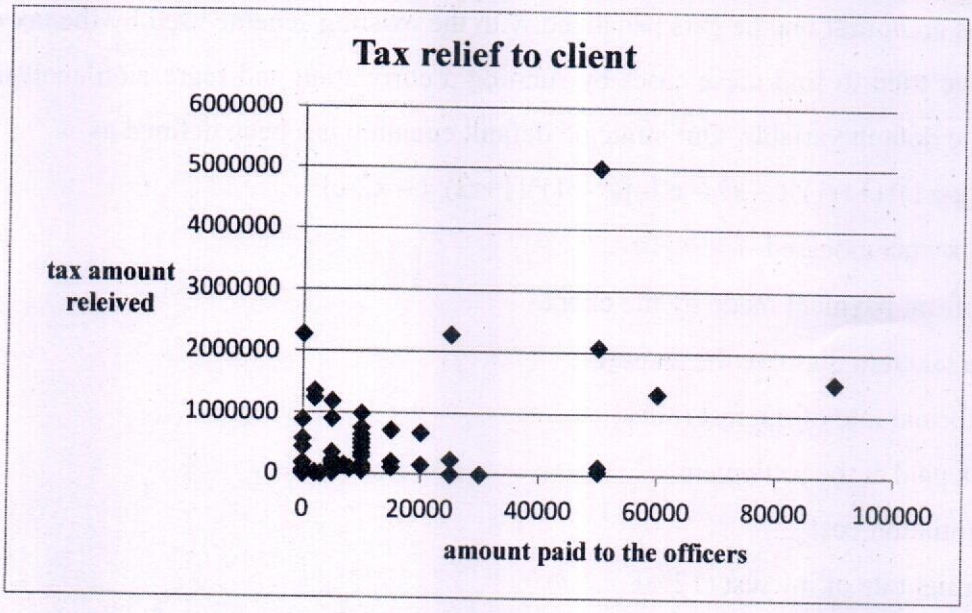
c) Relationship between government gain in the existing model and turnover



This shows us that government gain is also high when the defaulting company is one with high turnover.

a) Relationship between negotiation cost and tax amount relieved

Higher the negotiation cost (bribes etc) paid to the officers higher is the relief in the taxed amount, this is what the theory suggests. We have the information on the amount paid to the officers and the tax relieved using which a relationship can be observed between the two.



Observing the results of scatter plots and the summary statistics, we can try to fit some models and explain the relationships. We can see from the scatter plot that there exists a relationship between the two variables. We observe Non linear fits being better (details in the appendix)

How to safeguard honest and book dishonest?

Questions often might arise that the models would discourage honest tax pairs to go for disputes leading them to extreme victimization due to the system.What might the government do in this situation:

Government might ask the tax payers to pay a portion of disputed amount as an advance payment (like CESC). After the settlement is reached Government might think of refund at the rate either equal to or higher than existing rate of interest (12%)

There are two underlying benefits: Incentive to honest tax payers to fight for justice and bring down the huge gain of the dishonest client

Table-6

		Turnover	strategic default
Turnover	Pearson Correlation	1	.432
	Sig. (2-tailed)		.000
	N	86	86

New Model

In this model we assume that the client pays an upfront payment (this is the amount that was agreed by both the government and the client). Other than this upfront payment it is assumed that the client is asked to pay some θ_1 proportion of the disputed amount. The revenue function of the government thus stands at:

$=[x_1 +\theta_1 (x- x_1)] (1+ r_2)$ ^t

x= tax assessed

x_1= upfront payment

r_2= formal rate of interest (12%)

t= time taken to solve the case

θ_1 = proportion of disputed amount paid by the client earlier

r_3= virtual rate of interest (12% or15%)

r_1= informal rate of interest (30%)

c= Negotiation Cost

x_2= tax paid by the client at the end of settlement

θ_2: tax paid at the settlement/ disputed amount

In our data we have a variable, x_2 which is the tax paid by the client at the end of settlement. This is the actual amount which should be paid by the client after the dispute is settled. We thus add another term θ_2 to our equation that denotes the amount that the client is entitled to pay from the disputed amount.

Thus the final government gain is given as

$=[x_1 +\theta_1 (x- x_1)] (1+ r_2)$ ^t – $\{(\theta_1-\theta_2)(x-x_1)(1+r_3)$ ^t$\}$

Client gain

Difficulty in screening of honest tax payer:

It is usually seen that people default in their tax payments strategically. Dishonest tax payers invest the defaulted amount in the informal market that gives them a higher surplus for the period. An honest tax payer may not invest the defaulted amount in the informal market and would rather invest it in the formal market at a lower rate of interest. Thus, he would be gaining less in comparison to the dishonest tax payers. Government officials fail to screen such people when they penalize them by charging a higher tax later on. Thus, even if the tax payer is an honest one he gets penalized with the existing scheme used by the tax officials. We have tried to find these cases by running a correlation and regression analysis on the strategic default variable. Our strategic default equation has been defined as

D1= [(x-x1)*(1+r1)^t – x2 – c]- [(x-x1)*(1+r2)^t – x2-c]

Where x= tax assessed

x1= upfront payment made by the client

t= time taken to dissolve the dispute

r1= informal rate of interest (30%)

x2= tax paid at the settlement

c= negotiation cost

r2= formal rate of interest (12%)

Our objective is to find whether companies with high turnovers are more into this strategic default exercise. We have tried to regress strategic default variable D1 on turnovers observations tell that companies with high turnover i.e. large companies are more into strategic default because of which honest people get penalized.

Our regression equation is:

D1= c+ turnover

Results:

Correlation analysis-

The client in this case has to pay firstly x_1 amount as upfront payment and then is asked by the government to pay θ_1 proportion of the disputed amount. Thus the sum that is leftover with him on which he earns r_1, rate of interest is:

$= (1- \theta_1)(x-x_1)(1+r_1)\ ^t$

After the case is solved it is found that the client is entitled to pay θ_2 proportion of the disputed amount. In such a case the client gain equation is:

$\mathbf{(1- \theta_1)(x-x_1)(1+r_1)\ ^t + (\theta_1-\theta_2)(x-x1)(1+r_3)\ ^t - c}$

What happens if interest rates on refunds vary in new model?

- Ensure a prior payment θ_1 =10%, 25%,50% and 75%
- Current Scenario: r_2= 12%
- Introduce r_3=15%(more than r_2) and compare the pay offs for both the rates for various θ_1
- Intention: 1) to compensate the honest tax payers with a higher return (>r_2 say r_3)

  2) Cut down the incentives of a dishonest tax payer by lowering their pay off earned by investing in the informal sector at r_1 rate

- At r_3=15%: With increasing θ_1 clients pay off decreases and Government pay off increases compared to existing model
- At r_3=r_2=12%: With increasing θ_1 clients pay off decreases further. Government gain increases compared to the case when r_3=15%

Comparison: Old and New model

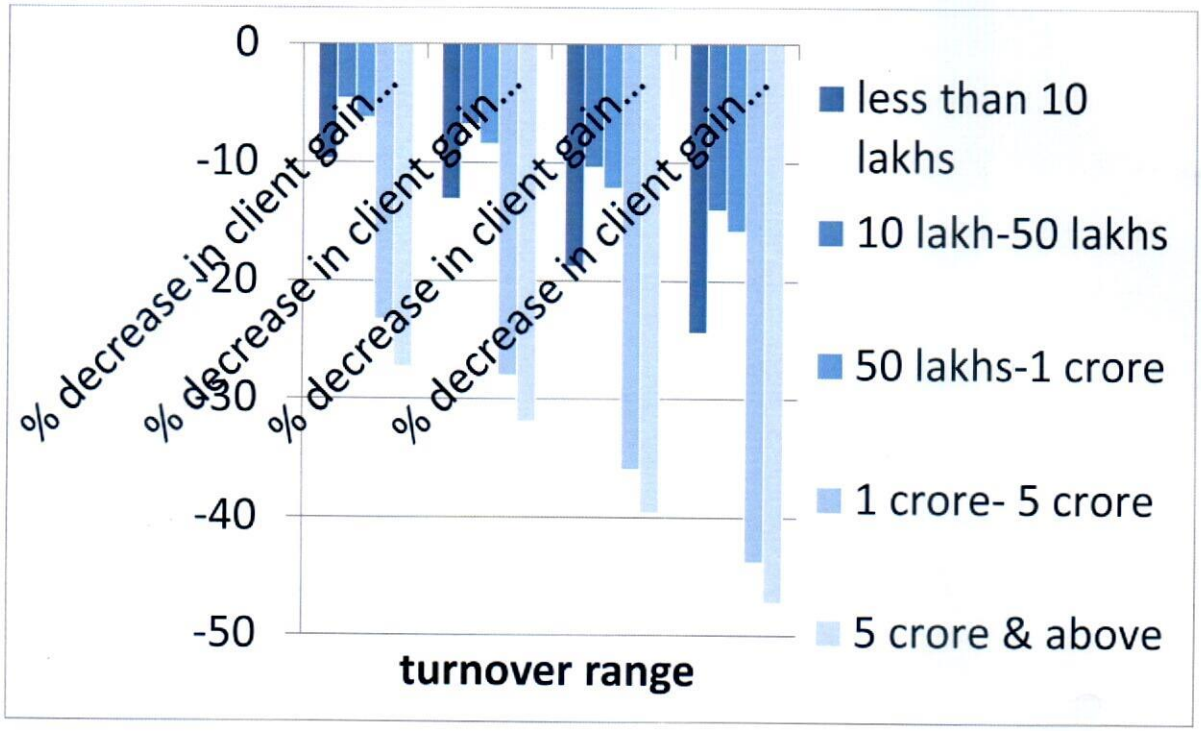
Table-7

		Model 5 (r_3=15%)				Model 5 (r_3=r_2=12%)		
turnover range	Gain of the client in model 1	client gain (Θ1=0.10)	client gain (Θ1=0.25)	client gain (Θ1=0.50)	client gain (Θ1=0.75)	client gain Θ1=0.25	client gain Θ1=0.50	Client gain Θ1=0.75
less than 10 lakhs	79578.2	71844.17	69146.57	64650.58	60154.59	69551.04	64200.73	58850.42
10 lakh-50 lakhs	454000.6	432924.5	423129.3	406804	390478.7	422802.4	403222	383641.7
50 lakhs-1 crore	385381.9	361241	352762.3	338631	324499.7	353562.8	336582.1	319601.4
1 crore-5 crore	968105.2	742602	696706.1	620212.8	543719.6	723751.6	633000.1	542248.6
5 crore & above	2466188	1792365	1678858	1489680	1300502	1762017	1535423	1308828

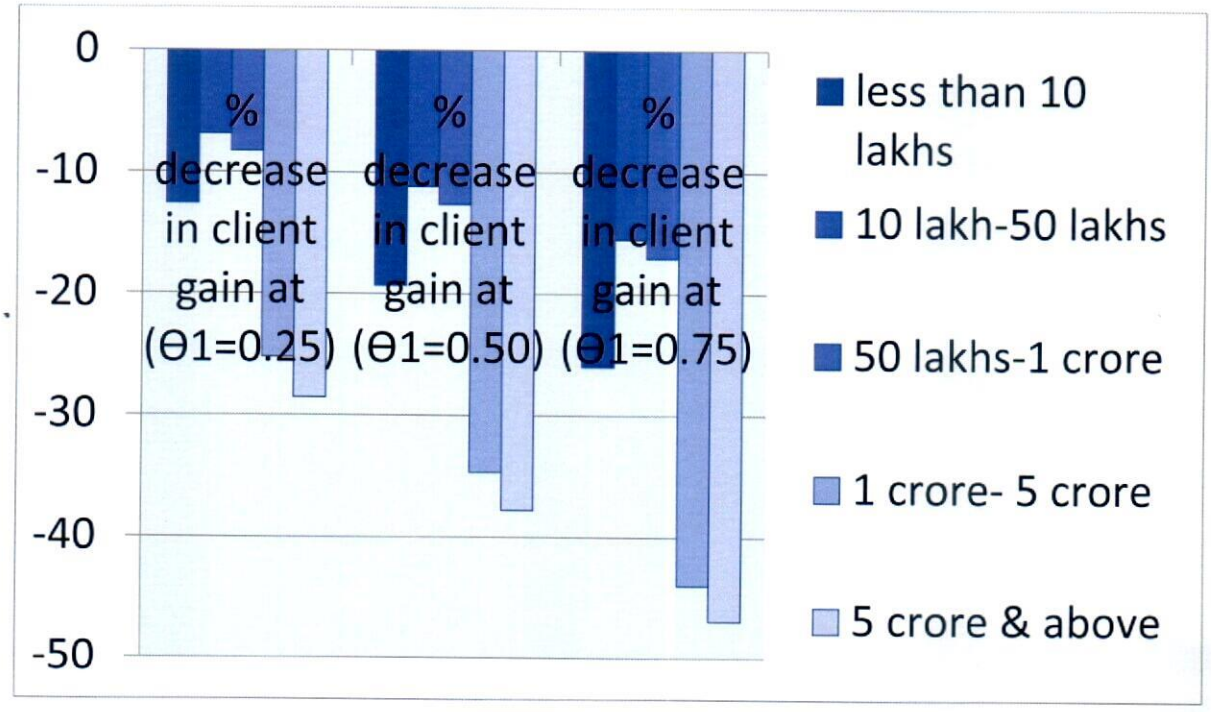
Client gain—reduced compared to existing model

	R_3=15%				R_3= R_2=12%		
turnover range	% decrease in client gain (Θ1=0.10)	% decrease in client gain (Θ1=0.25)	% decrease in client gain (Θ1=0.50)	% decrease in client gain (Θ1=0.75)	% decrease in client gain at (Θ1=0.25)	% decrease in client gain at (Θ1=0.50)	% decrease in client gain at (Θ1=0.75)
less than 10 lakhs	-9.71878	-13.1086	-18.7584	-24.4082	-12.6004	-19.3237	-26.0471
10 lakh-50 lakhs	-4.6423	-6.79982	-10.3957	-13.9916	-6.87184	-11.1847	-15.4975
50 lakhs-1 crore	-6.26415	-8.46425	-12.1311	-15.7979	-8.25651	-12.6627	-17.0689
1 crore- 5 crore	-23.2932	-28.034	-35.9354	-43.8367	-25.2404	-34.6145	-43.9887
5 crore & above	-27.3224	-31.925	-39.5958	-47.2667	-28.553	-37.741	-46.9291

Decrease in client gain at r_3=15%



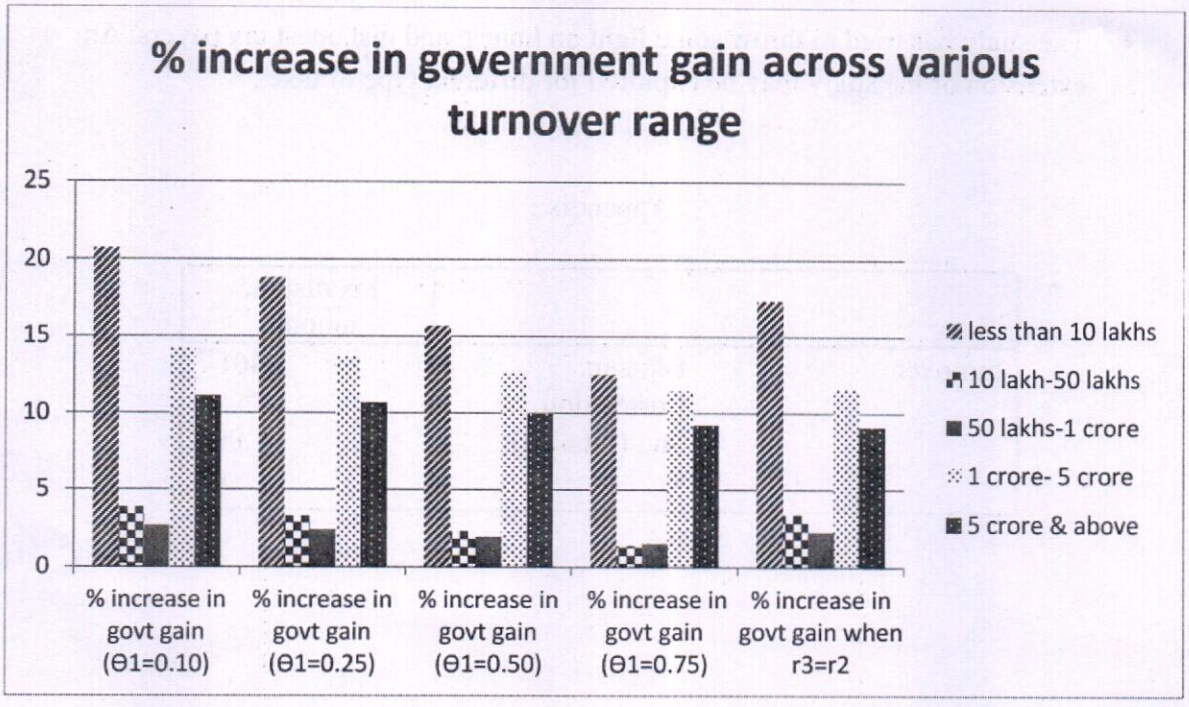
Decrease in client gain at r_3=12% for different θ_1



Government gain increased compared to existing model

	r3=15%				r3=12%
turnover range	% increase in govt gain (Θ1=0.10)	% increase in govt gain (Θ1=0.25)	% increase in govt gain (Θ1=0.50)	% increase in govt gain (Θ1=0.75)	% increase in govt gain when r3=r2 for all Θ1 values
less than 10 lakhs	20.71306	18.81504	15.65168	12.48831	17.3174
10 lakh-50 lakhs	3.855812	3.28722	2.339565	1.39191	3.382419
50 lakhs-1 crore	2.688438	2.423501	1.981941	1.54038	2.299443
1 crore- 5 crore	14.26607	13.62102	12.54593	11.47084	11.58175
5 crore & above	11.08914	10.66226	9.950797	9.239332	9.08101

Increase in Government gain (new model) for different θ_1



Is the Govt gain significant?

The model suggests an advance collection .It is expected that some people will refrain from litigation as the pay off reduces in the future.Govt can save if litigation reduces Lengthy process of tax disputes might be reduced to some extent and bribes paid earlier are expected to come to Govt exchequer in the first period Govt can use this fund for various sectors (like social sector).Total gain accrued to the Govt =Gain from investment in social sector + increased revenue

Future Research Plan

- Develop a theoretical model on strategic litigation
- Relate the study with Sales tax official data
- Try to find out the cost Government incurs for litigation
- Undertake a survey to understand the perception of various players on strategic litigation

Concluding remarks

The policy implications are important for the study

- A small intervention through collection of advance might stimulate tax payments and mop up funds for Govt for priority sector investment
- The study has tried to throw some light on honest and dishonest tax payers. An extension of the study may be explored for different type of taxes

Appendix :

		tax dispute amount
turnover	Pearson Correlation	.401**
	Sig. (1-tailed)	.000
	N	90

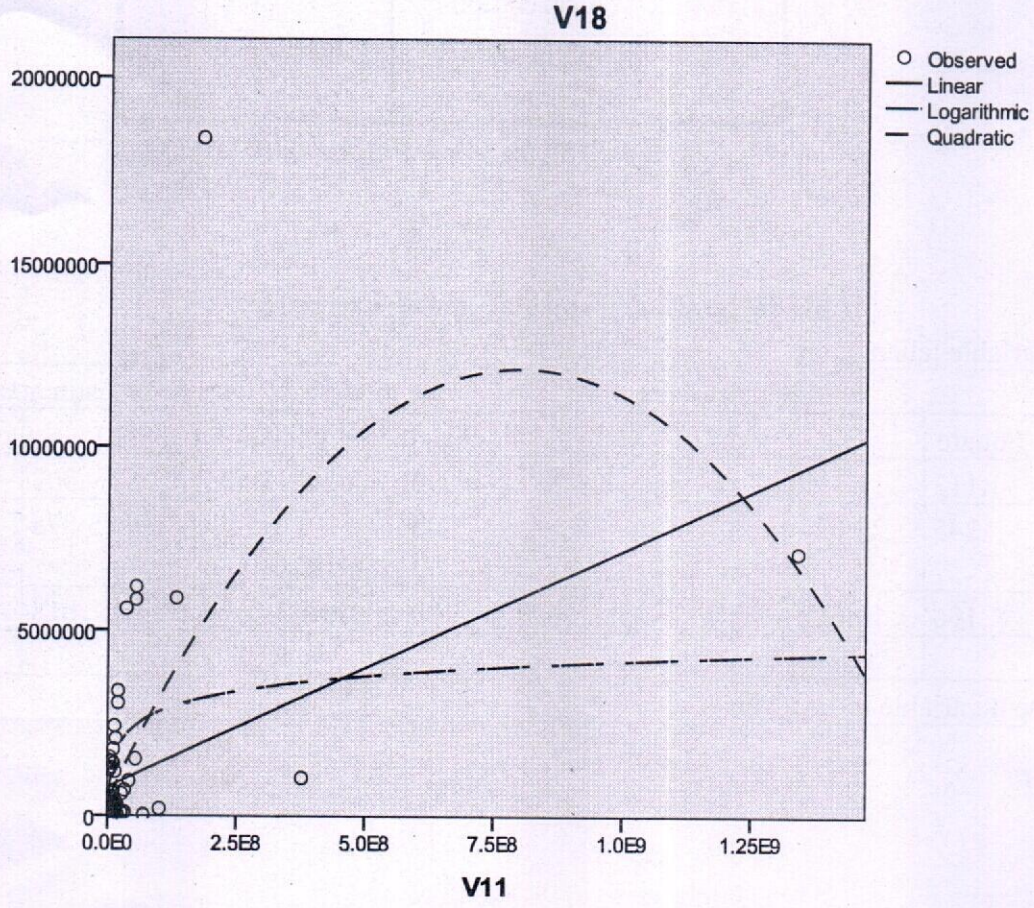
We find a moderate correlation between the two and thus we can use it to base our curve fitting model. We try to fit models such as linear, quadratic and logarithmic to see the best model amongst them. The results are as follows:

Model Summary and Parameter Estimates

Dependent Variable: turnover

Equation	Model Summary					Parameter Estimates		
	R Square	F	df1	df2	Sig.	Constant	b1	b2
Linear	.161	16.834	1	88	.000	768055.515	.006	
Logarithmic	.230	26.225	1	88	.000	-8292971.793	601887.406	
Quadratic	.298	18.494	2	87	.000	401312.432	.029	-1.838E-11

The independent variable is disputed amount



Quadratic model is the best one to establish the relationship between turnover and the disputed amount. We can say this looking at the R^2 value as well as the curve fitting graph.

a) Correlation between client gain and turnover

Scatter plot showed a relationship between client gain and turnover. To get a more concrete understanding we perform correlation and curve fitting analysis. The results obtained are as follows:

Correlations

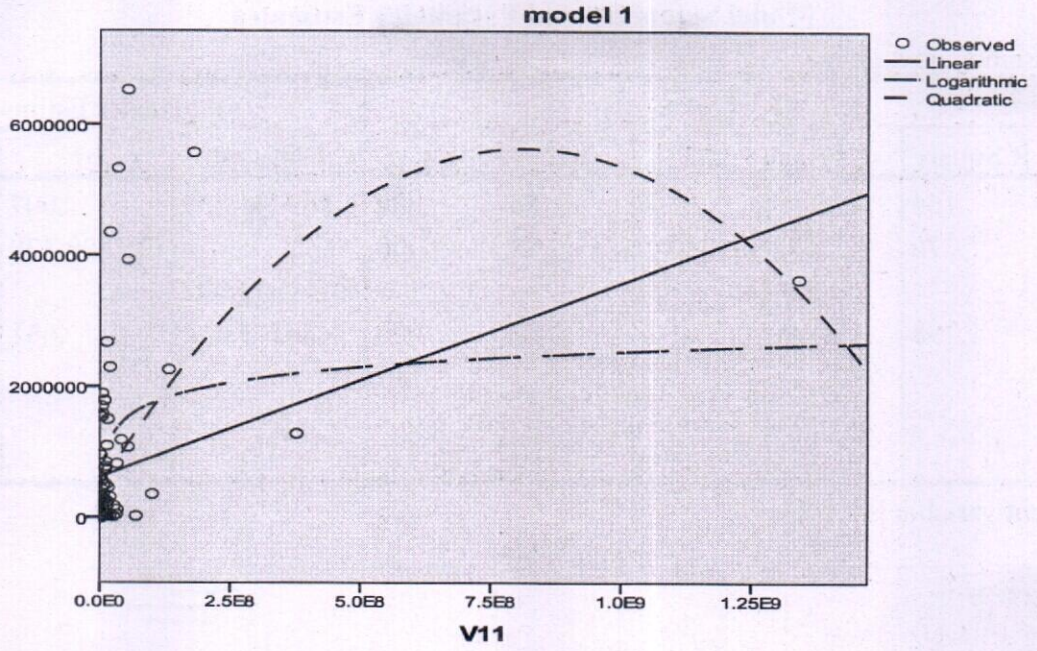
		V11	model 1
V11	Pearson Correlation	1	.336**
	Sig. (1-tailed)		.001
	N	90	90
model 1	Pearson Correlation	.336**	1
	Sig. (1-tailed)	.001	
	N	90	90

**. Correlation is significant at the 0.01 level (1-tailed).

Model Summary and Parameter Estimates

Dependent Variable :client gain

	Model Summary					Parameter Estimates		
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2
Linear	.113	11.199	1	88	.001	620311.636	.003	
Logarithmic	.245	28.624	1	88	.000	-4519711.530	339875.875	
Quadratic	.196	10.612	2	87	.000	464630.609	.013	-7.802E-12
Growth[a]	.	.	.	.	.	.	.	
The independent variable is turnover								



We find the best curve that establishes the relationship between turnover and client gain is the logarithmic model.

b) Correlation between government gain and turnover

Correlations

		turnover	Govt gain
turnover	Pearson Correlation	1	.406**
	Sig. (1-tailed)		.000
	N	90	90
Govt gain	Pearson Correlation	.406**	1
	Sig. (1-tailed)	.000	
	N	90	90

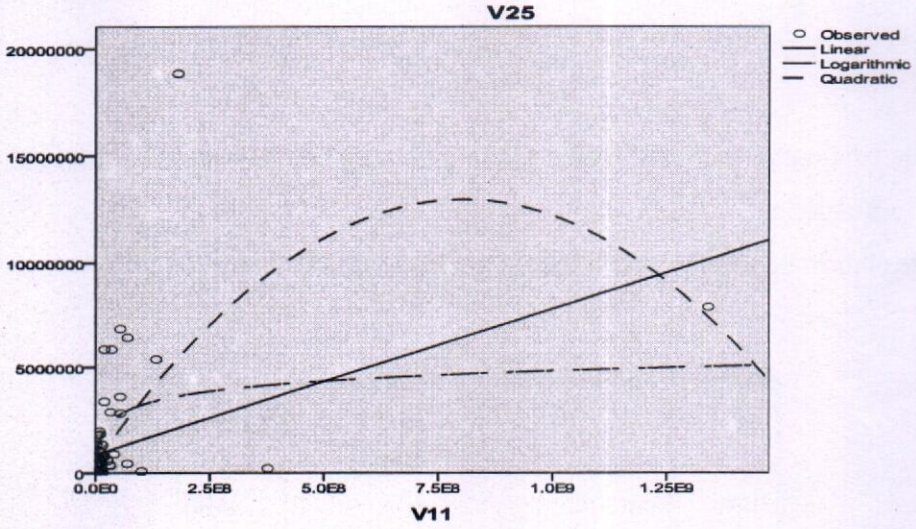
**. Correlation is significant at the 0.01 level (1-tailed).

Model Summary and Parameter Estimates

Dependent Variable: govt gain

Equation	Model Summary					Parameter Estimates		
	R Square	F	df1	df2	Sig.	Constant	b1	b2
Linear	.164	17.326	1	88	.000	869204.859	.007	
Logarithmic	.276	33.520	1	88	.000	-9715672.022	701809.378	
Quadratic	.298	18.498	2	87	.000	484593.414	.031	-1.928E-11
Growth[a]	.	.	.	.	.	.	.	
Exponential[a]	.	.	.	.	.	.	.	

The independent variable is turnover



c) Correlation between tax amount relieved and payment to the officers

The expected relationship between payment to officers and the tax amount relieved is given below:

Correlations

		Payment to officers	Relief tax
Payment to officers	Pearson Correlation	1	.487**
	Sig. (1-tailed)		.000
	N	90	90
Relief tax	Pearson Correlation	.487**	1
	Sig. (1-tailed)	.000	
	N	90	90

**. Correlation is significant at the 0.01 level (1-tailed).

Model Summary and Parameter Estimates

Dependent Variable: relief tax

	Model Summary					Parameter Estimates		
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2
Linear	.238	27.421	1	88	.000	148546.541	22.481	
Logarithmic[a]	.	.	.	.	.	.	.	
Quadratic	.240	13.736	2	87	.000	126386.127	27.815	-8.454E-5
Growth[b]	.	.	.	.	.	.	.	
Exponential[b]	.	.	.	.	.	.	.	
The independent variable is payment to officers								

Fiscal Deficit Disequilibrium in Centre-State Dynamics: Looking Afresh

Pinaki Chakraborti
The University of Burdwan

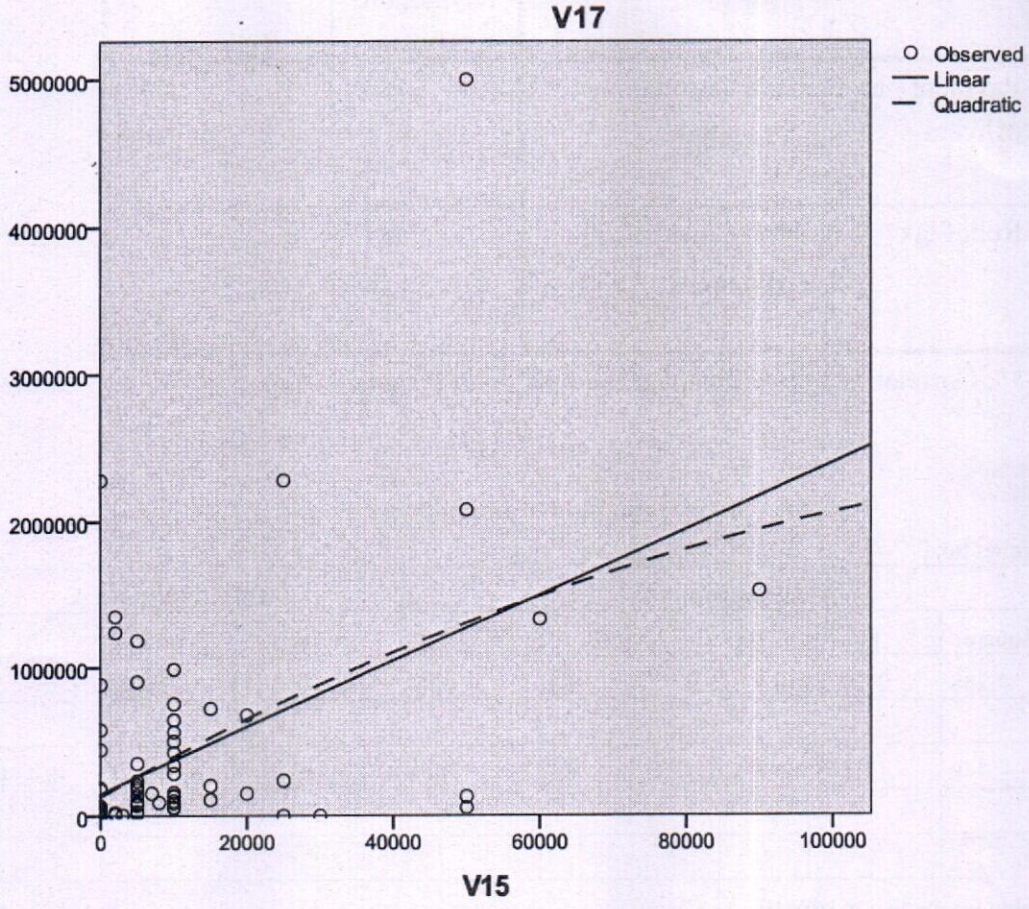
Sattwik Santra
Centre for Studies in Social Sciences, Calcutta

Supratik Guha
Centre for Studies in Social Sciences, Calcutta

Introduction

In the context of ongoing deficit financing (hereafter referred to as DF) history of the Indian economy the project entitled, "Fiscal Deficit Disequilibrium in Centre-State Dynamics: Looking Afresh" intended to examine empirically and theoretically the rationale behind DF when the economy has been on a continuous threat of non-sustainable growth within a foreseeable future. It proposed to envisage such allocations that result from DF, from two interdependent strands. First is the variational nature of the policy implications and second the existence of strategic interdependence among all the decision makers at different nodes. If proved, this will vindicate that the rationale emerges through that behind strategic interrelationships among the states, and between them and the Centre under a federal structure; this in turn would indicate that fiscal policies talking care of such relationships would be wise to look for optimal time paths of DF.

1. To carry out the intended investigation we undertook simultaneous work at the empirical and the theoretical aspects. After appointing Shri Supratik Guha as the Research Assistant immediately, we asked him to prepare the database. Properties span and time points were determined with certain distinguishable economic properties of intermediate periods (explained later on) and with relevance of data to DF the following instructions were primarily followed by Supratik in his data hunting endeavours.



References:

1. Sales Tax Manual (various years)

2.Christopher Klein (1989) : The Economics of Sham Litigation , Bureau of Economics Staff Report to the Federal Trade Commission

3. OECD cross country studies on Taxation

4. O'DONNELL (2004): Unified Theory of Antitrust Counterclaims in Patent Litigation,Virginia Journal of Law and Technology ,vol9

5. Proceedings of the workshop on Tax Litigation in India held in New Delhi in 2011

6. Simon Whitehead (2014) : Tax Disputes and and Litigation Review,Law Buisness Research

2. 15 Indian States and the Central Government were selected as decision making units and 32 time points according to some preliminary orientation of the search. In the early years one gets receipt series and expenditure (disbursement) series of individual States separately. We have to bring them side by side.

3. Overall surplus and deficits of the States and the Centre have to be taken, so that as they can be examined as percentages of GDP, State GDP, of total expenditure, total central allocations, loans over time , since our final objective is to understand the trajectories of fiscal deficits.

4. Look for the major contributing item(s) in expenditure accounting for the deficit/surplus; for this total receipts, revenue receipts detailed, disbursements of selected states have to be taken.

5. States' share in total central tax revenues in revenue receipts needs to be taken.

6. Take grants from the centre for the states, also as percentage of total grants to states.

7. Also take total central allocations to the States, along with developmental, non developmental, Plan and non-Plan disbursements to the selected States.

8. Take loans with sources (Institutions categorized into market and nonmarket) mentioned.

9. Total liabilities (debts) of the states and the Centre have to be taken.
10. Make a separate table for developmental and non-developmental expenditure of the states and the centre.

11. Expenditure on social and community services table for Center and the states also.

12. Expenditure on Economic Services, Water & Power, Transport and Communications have to be tabulated.

13. Overall debt position of the centre, both internal and external have to be taken and a time series on annual inflation, unemployment statement of the states (see state economic reviews).

The contextual considerations were mainly the strategic interdependent nature of decisions of the units that is embedded in the competitive attitude of governments under federal structure. Its relevance have been endorsed from the literature referred and surveyed in a subsequent section (Literature Survey). Now, competition among sub-national governments under federal structure may lead to misallocation of fiscal expenditure and perennial inefficiencies and so needs policy attention since sustainability of deficit financing has to be reexamined under such a framework.

The Indian economy like many other less developed economies had been suffering from speedy accumulation of public debt till the early 1990's, though some reducing trend has been visible of late. The malady of persistent deficit of expenditure over revenue earnings of governments in a number of LDCs with serious open economy macroeconomic implications induce a rethinking of deficit financing.

The present work carries out an investigation empirically and theoretically, the rationale of deficit financing as a policy approach to development and depression especially under federal financial allocation regimes The essential policy-points of a few significant papers have been unsustainability of deficit financing over time.

Literature

- The cases of India have been examined recently in a number of papers such as Chelliah (1992) Mundle and Rao(1996), looking for new tax sources dates even back to Bagchi(1979) The concern in this papers were mainly the dangers of getting into increasing fiscal deficit.

- Sometimes redesigning tax structure in the direction of VAT or towards more return-oriented less expenditure-intensive manner has also been suggested (Dahl and Mitra(1991), Chelliah(1992), Buiter and Patel (1997) Rakshit (2000, 2002) and Easter and Schmidt-Hebbel(1993).

- Mundle and Rao (1997) have advocated for fiscal decentralization and suggested more responsibility to the states as a necessary step towards stabilization.

- As Jadhav and Neelankavil (2011) and many others have observed, the objective in seeking deficit financing is to finance the shortfall between government expenditures and tax receipts.

- It is possible to identify signals that may be useful for corrective measures regarding the domestic debt macroeconomics [Chamberlin (2006)].

- In another research, Stein used variables such as the optimal foreign debt, consumption, capital and the growth rate of GDP similar to the approach to be taken by the present proposed work. By comparing the actual debt to the optimal debt he was able to derive a measure of the sustainability of the debt and vulnerability to default problems (Stein, 2005).

- It has been observed that when aggregate spending is sizably short of the required level for utilizing full GDP potential, deficit financing is justified [Krugman (2010)].

Note that there have been a few significant criticisms of the existing theories of economic policy.

- In an excellent brief survey of the theory of economic policy Polimarchakis (2002) summarized the main lacunae existing in the theoretical structure that guides economic policies.

Assumptions as Polimerchakis listed

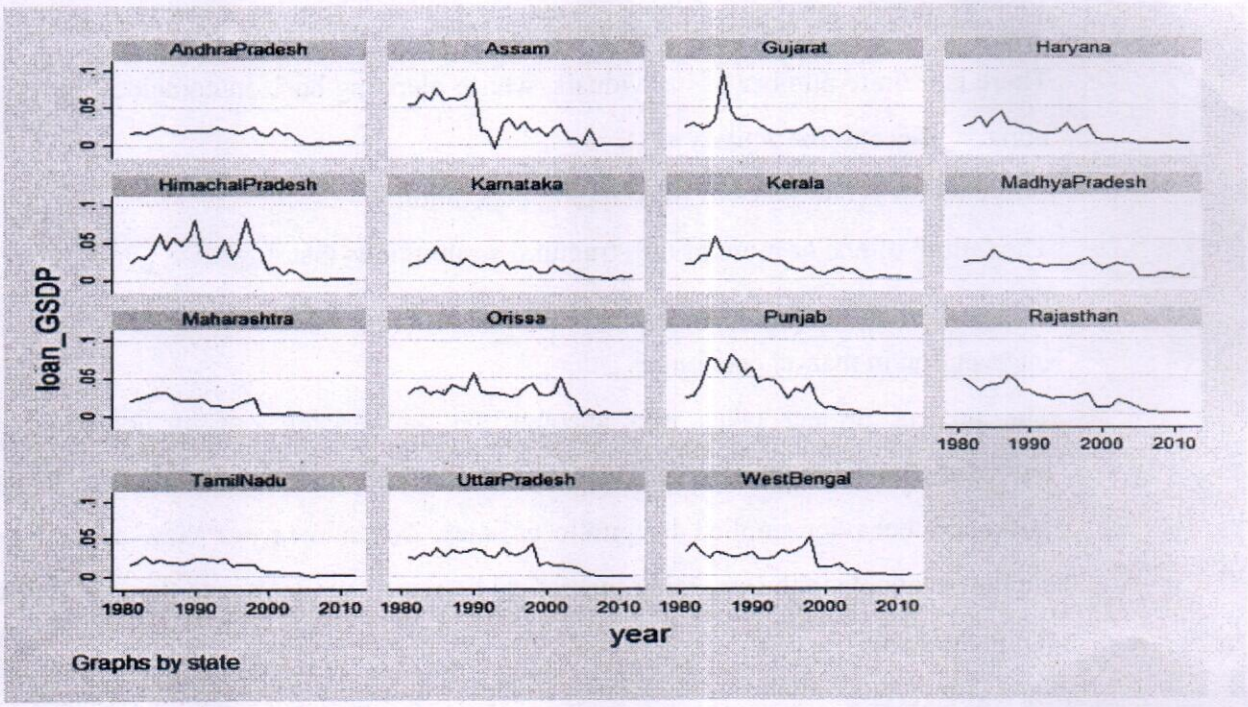
- Individuals do not interact strategically
- The asset market is complete, and participation is unrestricted
- There is a finite number of individuals, whose planning horizon coincides with the horizon of economic activity
- This excludes economies of overlapping generations.
- The failure of one or more of the structural assumptions that, together, guarantee the Pareto optimality of competitive allocations is the starting point of a theory of intervention in market economies
- The present project takes into account the gap arising out of non-strategic interrelationship assumption and that out of disregarding the sequential nature of the allocation behavior implied by public policies. To endorse our view apart from support available in the emerging theoretical literature, we dealt with the empirics of the focal space.

An Empirical Exercise

- We formulate an empirical exercise where we validate the claims that there exists significant strategic inter-relationships between the states over various financial claims that a state has over the centre. For our purpose, we consider two such claims: loans and grants.
- We sift through the financial accounts of 15 major Indian States (Andhra Pradesh, Assam, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal) and the Centre considering 31 time-points (1982-2012). We concentrate on whether the loans and the grants as obtained by the states, are significantly positively interdependent with each other.
- For our dependent variable, we consider the loan-to-GSDP ratio and the grant-to-GSDP ratio. (**Both these variables are stationery**)
- Before proceeding further, some figures…

Data

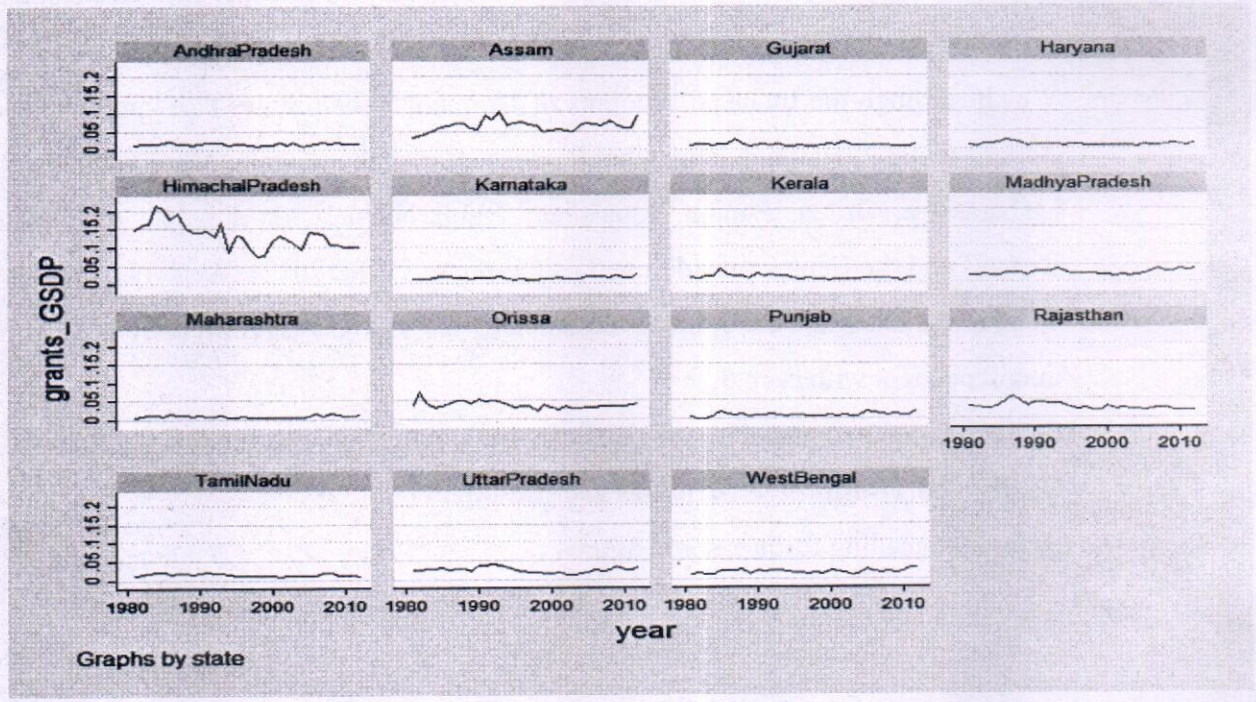
Evolution of Loan to GSDP ratio.



The trend after 2000 in many states show diminished variations.

Data

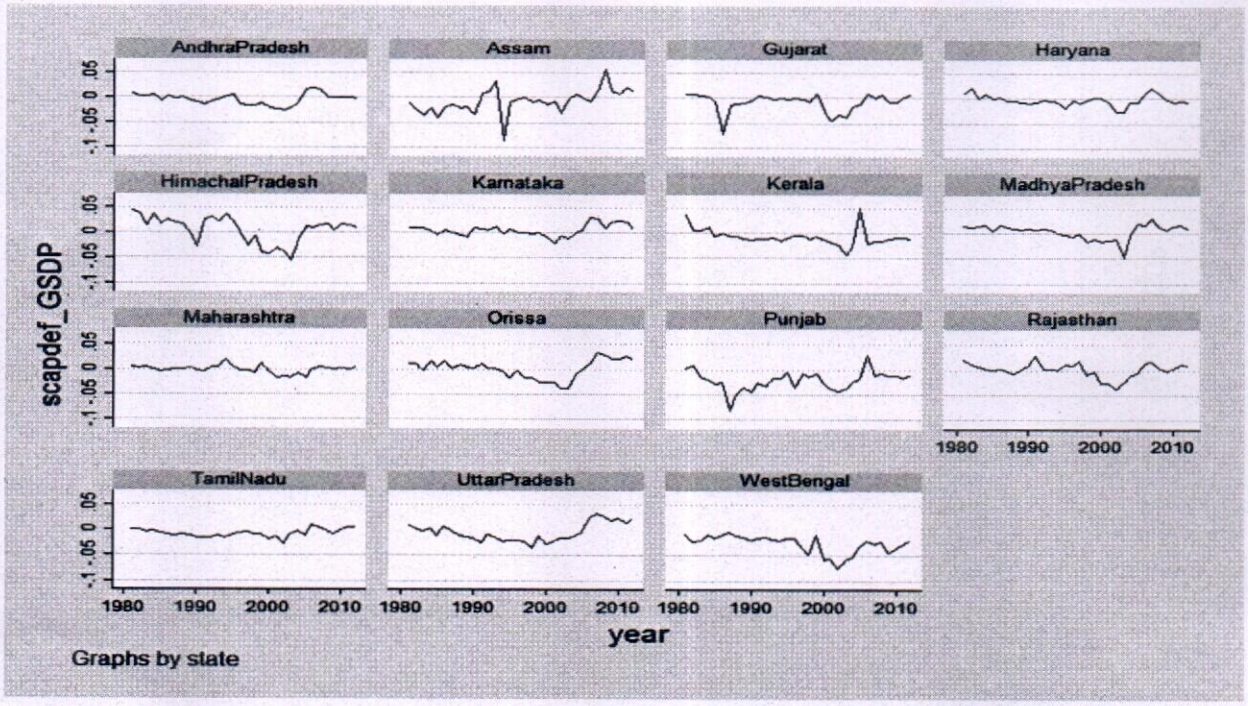
Evolution of Grant to GSDP ratio.



The trend after 2000 in many states show diminished variations.

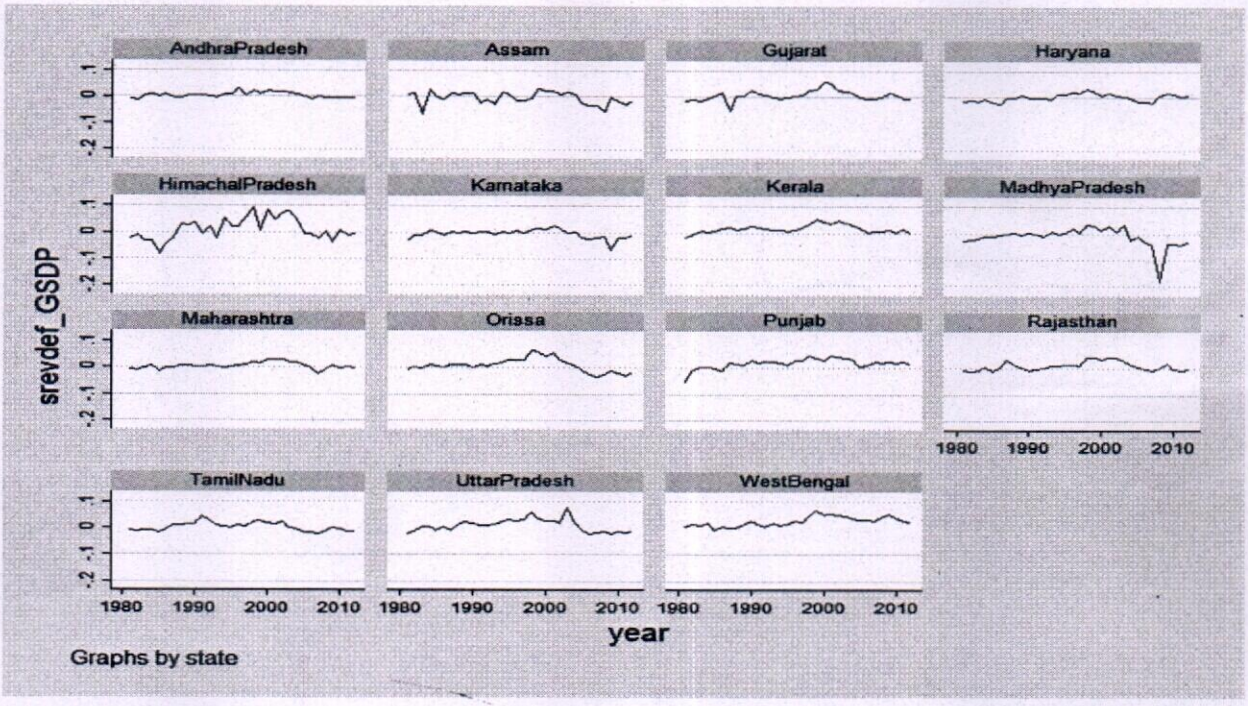
Data

Evolution of States' Capital Deficits.



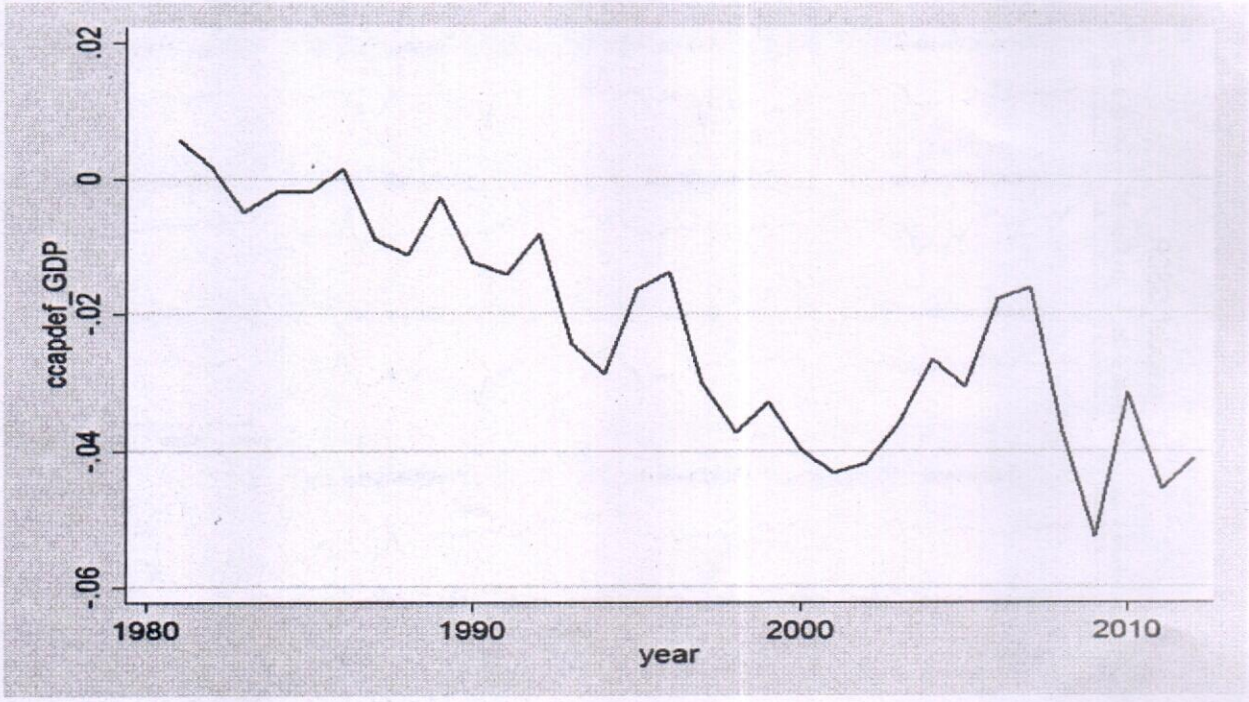
Data

Evolution of States' Revenue Deficits.



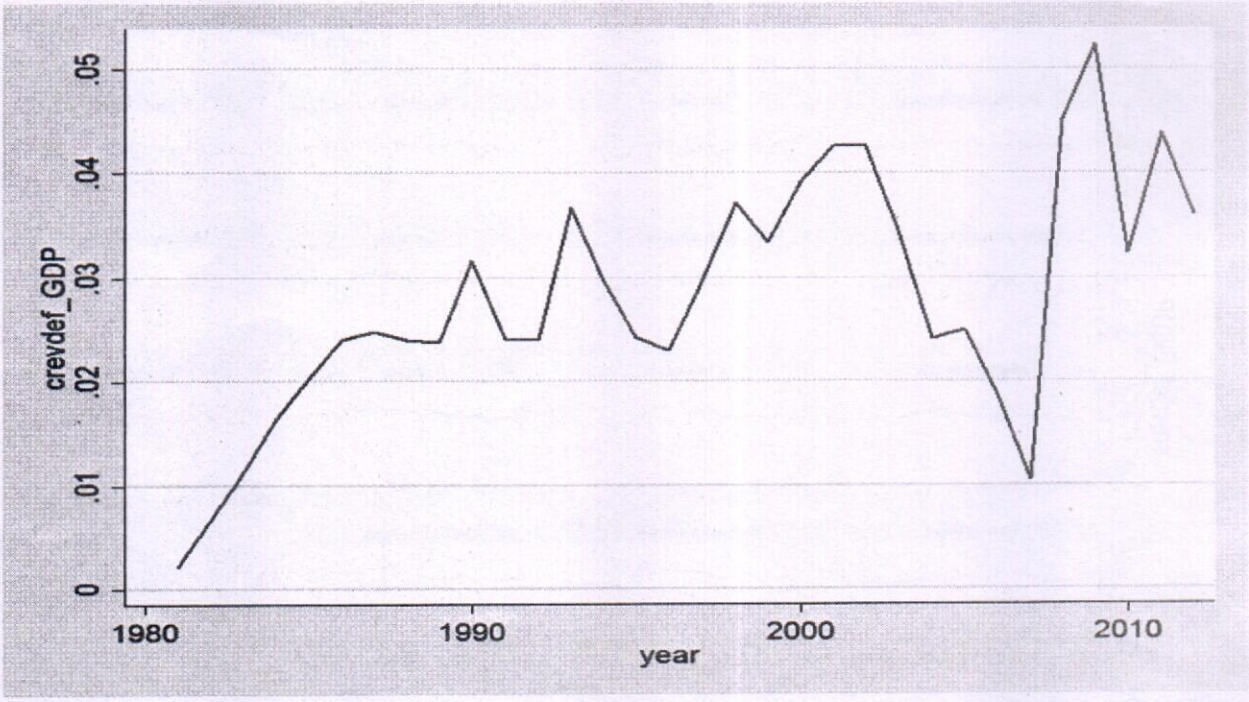
Data

Evolution of Central Capital Deficit.



Data

Evolution of Central Revenue Deficit.



An Empirical Exercise

- To test for inter-state strategic dependence {for loans and grants), we specifically estimate the following spatial model:

$$Y = \lambda WY + X\beta + \varepsilon$$

- For our weight matrix, we consider two alternative formulations:
  1. Where the dependent variable for state '*i*' at time point '*t*', is dependent on the dependent variable for state '*j*' ($j \neq i$) of the same time point only.
  2. Where the dependent variable for state 'i' at time point '*t*', is dependent on the dependent variable for state '*j*' ($j \neq i$) of the time points '*t*' and '*t-1*' only.

- Thus for the first formulation, we estimate the following relationship:

$$y_{it} = \lambda \sum_{j \neq i} y_{jt} + X_{it}\beta + \varepsilon_{it}$$

- While for our second formulation we estimate the relationship given by:

$$y_{it} = \lambda \sum_{j \neq i} \sum_{s=t,t-1} y_{js} + X_{it}\beta + \varepsilon_{it}$$

- For both of the above models, we assume that the errors are heteroscedastic but uncorrelated. We also take the lagged values of the dependent variable (upto two periods) as our independent variable toether with a host of other control covariates.

- The controls include: panel fixed effect dummy, **time fixed effect dummy,** time trend, states' poor population percentage, states' literacy rate, states' infant mortality rate, center's revenue deficit to GDP ratio, center's capital deficit to GDP ratio, one and two period lagged values of center's revenue deficit to GDP ratio and center's capital deficit to GDP ratio, one and two period lagged values of states' revenue deficit to GSDP ratio and states' capital deficit to GSDP ratio, **dummies for political power similarity between center and states.** – thus we have a total of 20 control variates.

An Empirical Exercise: Results for loan-GSDP ratio

Regression	1	2	Regression Continued...	1	2
AR(1)	0.3630***	0.3726***	poor_spop_percent	-0.0001	-0.0002**
	(0.0771)	(0.0785)		(0.0001)	(0.0001)
AR(2)	0.2310***	0.1894***	literacy_percent	0.0002	0.0003
	(0.0591)	(0.0576)		(0.0002)	(0.0002)
pvar2	0.0047	0.0063*	imr	0.0001	0.0001
	(0.0035)	(0.0034)		(0.0001)	(0.0001)
pvar3	-0.0003	-0.0006	year	0.0008**	0.0002***
	(0.0029)	(0.0029)		(0.0003)	(0.0000)
pvar4	-0.0027	-0.0032	crevdef_GDP	-0.0770	0.0186
	(0.0024)	(0.0024)		(0.1069)	(0.1097)
pvar5	0.0024	0.0009	ccapdef_GDP	-0.1028	-0.0469
	(0.0040)	(0.0039)		(0.1297)	(0.1337)
pvar6	0.0004	0.0003	l_crevdef_GDP	-0.0400	0.0898
	(0.0018)	(0.0018)		(0.1053)	(0.1094)
pvar7	-0.0018	-0.0051	l_ccapdef_GDP	0.0532	0.1848
	(0.0046)	(0.0047)		(0.1180)	(0.1185)
pvar8	0.0001	0.0026	l2_crevdef_GDP	-0.0231	0.0778
	(0.0034)	(0.0032)		(0.0769)	(0.0764)
pvar9	-0.0021	-0.0025	l2_ccapdef_GDP	-0.0052	0.0988
	(0.0025)	(0.0026)		(0.0887)	(0.0790)
pvar10	0.0040	0.0073*	l_scapdef_GSDP	-0.0606*	-0.0451
	(0.0040)	(0.0039)		(0.0315)	(0.0325)
pvar11	0.0040	0.0024	l_srevdef_GSDP	0.0124	0.0139
	(0.0028)	(0.0028)		(0.0244)	(0.0239)
pvar12	0.0014	0.0024	l2_scapdef_GSDP	0.0596**	0.0565*
	(0.0017)	(0.0016)		(0.0302)	(0.0305)
pvar13	-0.0018	-0.0023	l2_srevdef_GSDP	-0.0166	-0.0110
	(0.0023)	(0.0023)		(0.0249)	(0.0256)
pvar14	0.0026	0.0051*	SameParty	-0.0012	-0.0016
	(0.0029)	(0.0028)		(0.0014)	(0.0014)
pvar15	0.0022	0.0026	OppositionParty	-0.0010	-0.0009
	(0.0024)	(0.0026)		(0.0012)	(0.0012)
td1	0.0101*	0.0134***	Constant	-1.5807**	-0.3265
	(0.0056)	(0.0044)		(0.6222)	(0.0000)
td2	0.0039	0.0051	**Lambda**	**0.0602*** **	**0.0142*** **
	(0.0044)	(0.0043)		**(0.0079)**	**(0.0028)**
td3	0.0035	0.0028			
	(0.0032)	(0.0028)			
td4	-0.0008	0.0008			
	(0.0019)	(0.0016)			

- *,**,*** denote significance at 10%, 5% and 1% levels respectively.
- Figures in parenthesis are standard errors.
- Model numbers 1 and 2, correspond to our formulations 1 and 2 respectively.

An Empirical Exercise: Results for grant-GSDP ratio

Regression	1	2	Regression Continued...	1	2
AR(1)	0.4836***	0.4779***	poor_spop_percent	-0.0001	-0.0001
	(0.1150)	(0.1149)		(0.0002)	(0.0002)
AR(2)	0.2405**	0.2166**	literacy_percent	-0.0001	-0.0001
	(0.1066)	(0.1052)		(0.0002)	(0.0002)
pvar2	0.0215***	0.0206***	imr	-0.0001	-0.0001
	(0.0047)	(0.0046)		(0.0000)	(0.0000)
pvar3	0.0010	0.0007	year	-0.0000	0.0004***
	(0.0026)	(0.0025)		(0.0004)	(0.0001)
pvar4	-0.0010	-0.0014	crevdef_GDP	-0.0047	0.1084
	(0.0025)	(0.0024)		(0.1059)	(0.1103)
pvar5	0.0382***	0.0359***	ccapdef_GDP	0.0169	0.1724
	(0.0129)	(0.0127)		(0.1302)	(0.1346)
pvar6	0.0025	0.0028*	l_crevdef_GDP	-0.0352	0.1863*
	(0.0017)	(0.0016)		(0.1129)	(0.1032)
pvar7	0.0021	0.0018	l_ccapdef_GDP	-0.0280	0.2918***
	(0.0065)	(0.0062)		(0.1287)	(0.1108)
pvar8	0.0083***	0.0082***	l2_crevdef_GDP	-0.1232	-0.0500
	(0.0031)	(0.0030)		(0.0766)	(0.0703)
pvar9	0.0005	0.0005	l2_ccapdef_GDP	-0.1776*	-0.0967
	(0.0027)	(0.0025)		(0.0994)	(0.0857)
pvar10	0.0133***	0.0129***	l_scapdef_GSDP	0.0269	0.0298
	(0.0037)	(0.0036)		(0.0351)	(0.0362)
pvar11	-0.0010	-0.0013	l_srevdef_GSDP	0.0225	0.0174
	(0.0037)	(0.0036)		(0.0308)	(0.0303)
pvar12	0.0052***	0.0050***	l2_scapdef_GSDP	0.0029	-0.0027
	(0.0018)	(0.0018)		(0.0355)	(0.0349)
pvar13	0.0025	0.0027	l2_srevdef_GSDP	-0.0316	-0.0191
	(0.0024)	(0.0022)		(0.0342)	(0.0337)
pvar14	0.0064**	0.0063**	SameParty	0.0012	0.0020*
	(0.0030)	(0.0029)		(0.0011)	(0.0011)
pvar15	0.0048**	0.0050**	OppositionParty	-0.0013	-0.0011
	(0.0021)	(0.0021)		(0.0009)	(0.0009)
td1	0.0018	0.0091*	_cons	0.0802	-0.8534***
	(0.0065)	(0.0051)		(0.6981)	(0.2694)
td2	-0.0009	0.0012	**lambda_cons**	**0.0631*** **	**0.0093** **
	(0.0054)	(0.0045)		**(0.0103)**	**(0.0039)**
td3	-0.0003	0.0019			
	(0.0041)	(0.0031)			
td4	0.0039	0.0041**			
	(0.0026)	(0.0018)			

- *,**,*** denote significance at 10%, 5% and 1% levels respectively.
- Figures in parenthesis are standard errors.
- Model numbers 1 and 2, correspond to our formulations 1 and 2 respectively.

An Empirical Exercise: Conclusions

- Thus our empirical model seems to suggest that the states' claims of resources from the center is significantly inter-dependent.
- In the ensuring slides, we discuss from a theoretical perspective, the possible impacts of this inter-dependence on the dynamics of various macro-economic variables and aggregates.

The Theoretical Exercise

As Jadhav and Neelankavil (2011) and many others have observed, the objective in seeking deficit financing is to finance the shortfall between government expenditures and tax receipts. Tax increases are not politically palatable. Governments often resort to deficit financing when other components of GDP such as private consumption decline during recessionary periods. It depends on certain factors whether the DF will be sustainable or not. Structural deficits are indicative of inability to reduce entrenched government expenses. The sustainable level of accumulated deficits can also be determined with reference to both the deficit servicing requirements and deficit servicing sources. The present analysis like Jadhav and Neelankavil, will attempt identification of cause and effect relationships that determine the factors influencing each of these two areas. Though the purpose finally is to understand the open economy macroeconomics of DF, it requires looking into the microeconomics of debt and its use by the debtors to locate the consequent sources of possible unsustainability of DF. The debtors in this case are the states and the central government coalescing in a bargaining relationship implicitly working out subsequently and for this purpose empirical analysis of such relationships will be carried out as stated below:

Public Deficit Financing = $M_f + D_d + D_e$ (i)

where M_f = Money Financing; D_d = domestic debt financing and D_e = External debt financing and D is public Deficit.

Or $D = I_G - S_G$ (ii)

where D = public deficit I_G = Public Investment and S_G = Public saving is private saving; I_p is private investment and S_e is external savings.

Or $D = (S_P - I_P) - S_e$ (iii)

Where S_P is private saving; I_P is private Investment and S_e is external (Foreign) savings. The objective is to form some hypothesis on the relationship between GDP and DF, which will then be tested over a time series data pertaining to the countries mentioned above.

As implied by the above equations and also as shown by other researchers including Jadhav and Neelankavil, the explanatory variables leading to deficits include domestic budgetary receipts; tax structure; budgetary endowments; budgetary discretionary expenses; trade deficit; growth in real GDP; private consumption; domestic capital formation; and foreign direct investment flows. Deficit servicing requirements analysis takes into account accumulated deficit; expected additions to deficit; deficit held by Government Accounts, by Federal Reserve System, by public–domestic entities, by overseas public & governments, maturity term; and cost of debt.

The historical appraisal will take account of these variables, or representative dummies over time to estimate the dynamic relationship postulated by Jadhav and Neelankavil:

$$\alpha D = (1 - \delta)GDP \qquad \text{(iv)}$$

Where α and δ are the stimulus multiplier and growth multiplier (induced by the stimulus) to GDP respectively. The estimations will be carried out on secondary data, publicly available that will be complemented by purchased data.

Following Feldstien (1974) a simple presentation of benefits may be written as

$$V = \sum_{t=0}^{T} \frac{b_t - [pS + (1-p)]C_t}{(1+r)t} \qquad (1)$$

where V is the value of the benefit generating project pC_t is the reduction in investment, and $(1\text{-}p)C_t$ is that in consumption due to a tax, and investment has a shadow price value , sacrificed consumption, S with r being discount rate. Introducing further details in the benefits and costs side such as cash expenditure e_t and user charge revenue, the expression will be further complicated. The idea behind this equation (1) is that while G generates benefit, b, fall in investment and consumption, due to decreased disposable income because of tax, benefits will decrease accordingly.

What essentially follows from the expression that every public supply 'G' has a benefit side, with a price (user charges and sacrificed consumption over time) to be paid by the people

under the jurisdiction, setting this price in terms of some payments per unit as the user price. Let demand for benefits by people under jurisdiction be

$$B_t = S^{-\epsilon}e^{kt} \quad (2)$$

where S is the price.

This benefit is produced by a per unit cost say τ_{it} and thus the V in a continuous time case be written as

$$V = \int_0^{\infty}(S_t - \tau_{it})B_t e^{-rt}dt \quad (3)$$

Provided the entire cost is covered by τ_{it} per unit; r is the discount factor.

In this context option involves borrowing on that part of the governments at different points of time. In a dynamic context, if we introduce overdrafts D_{it}, without any additional benefits resulting from borrowing, D_{it} is likely to perpetuate a fact which is not supported by laws of economies. A permanent inter-temporalborrower is not allowed.

Hence we assume every time there is some D_{it}, there is a reduction in τ_{it}, which means the unit cost of producing the benefits reduces. As if the government try to modernize activities and organizations and make things more efficient using the borrowed finance. This is captured in

$$\frac{-1}{\tau_{it}}\frac{d\tau_{it}}{dt} = R(D_{it}) = \theta(\text{say}) \quad (4)$$

Then the benefit over a long time horizon with final solvency can be written as

$$\int_0^{\infty}[(S_t - \tau_{it})B_{it} - D_{it}]e^{-rt}dt$$

This is the objective function that the state governments maximize subject to equation (4).

Thus using optimal control theory, the Present value Hamiltonian

$$H = [(S_t - \tau_{it})B_{it} - D_{it}]e^{-rt} - e^{-rt}\varphi R(D_{it}) \quad (5)$$

The required optimality conditions yield:

$$S_t\left(1 - \frac{s_i V_{ij}}{\epsilon}\right) = \tau_{it}\forall i = 1,..n \quad (6)$$

where$V_{ij} \equiv \frac{\partial B_t}{\partial B_{it}}/\frac{B_t}{B_{it}}$

$$\varphi = -\frac{1}{R'(D_{it})} \quad (7)$$

$$\varphi' e^{-rt} - r\varphi e^{-rt} = \Gamma_{it}(\equiv \tau_{it}B_t e^{-rt}) \quad (8)$$

Following (6) and (7);

Since optimal control requires $\frac{\partial H_t}{\partial D_{it}} = -\dot{\theta}, \frac{\partial H}{\partial \theta} = \dot{D}_{it} \Rightarrow \frac{R''}{(R')^2}\dot{D}_{it} + \frac{r}{R'} = \Gamma_{it}$ (9)

or, $\dot{D}_{it} = \frac{(R'\Gamma_{it} - r)R'}{R''}$ (10)

As, $\Gamma_{it} = \tau_{it} B_t e^{-rt}$, we have,

$$\frac{\dot{\Gamma}_{it}}{\Gamma_{it}} = \frac{\dot{\tau}_{it}}{\tau_{it}} - \frac{s_{ij}}{\epsilon} + k$$

or, $\frac{\dot{\Gamma}_{it}}{\Gamma_{it}} = (1-\epsilon)\frac{\dot{\tau}_{it}}{\tau_{it}} + k$

or, $\dot{\Gamma}_{it} = \Gamma_{it}\left[(1-\epsilon)\frac{\dot{\tau}_{it}}{\tau_{it}} + k\right]$ (11)

or, $\dot{\Gamma}_{it} = \Gamma_{it}[(1-\epsilon)R(D_{it}) + k]$

Thus we are left with two differential equations which are as follows:

$\dot{D}_{it} = \frac{(R'\Gamma_{it} - r)R'}{R''}$ (10)

$\dot{\Gamma}_{it} = \Gamma_{it}\left[(1-\epsilon)\frac{\dot{\tau}_{it}}{\tau_{it}} + k\right]$ (11)

By methods of isoclines $\dot{D}_{it} = 0 \Longrightarrow \Gamma_{it} = \frac{r}{R'}$: a curve with positive slope and intercept in Γ_{it}-D_{it} plane (figure 1):

And as $R'' < 0$, $\dot{D}_{it} > 0$ above and $\dot{D}_{it} < 0$ below this curve, the laws of motion are as depicted in Figure 1 below.

From the other equation:

$\dot{\Gamma}_{it} = 0$ for $\Gamma_{it} > 0$ then, $(1-\epsilon)\frac{\dot{\tau}_{it}}{\tau_{it}} = -k$ or, $R(D_{it}) = -\frac{k}{1-\epsilon}$

which is a vertical line in the Γ_{it}-D_{it} plane (figure-1).

With $\epsilon < 1$, if the benefit supplied concerns essential goods and services like safe drinking water, health care or other essential heavy industry for development , then we have a steady state deficit financing path with constant debt burden and a path from $\dot{D}_{it} > 0$ or $\dot{D}_{it} < 0$ to $R(D_{it}) = -k/(1-\epsilon)$, the saddle path. This can be proved using a Taylors's Series expansion about the equilibrium and calculating characteristic roots. It is left to the reader. Hence we get the proportions:

Proposition 1: *If there is a steady state D_{it} and Γ_{it} combination, the states will experience constant loan/GSDP ratio over time.*

Proposition 2: If t*he state governments appeal for efficient utilization of a constant debt from the central government, it implies efficient provisions of public services of the center will be necessary for the states to be able to do their best.*

Proposition 3: *Continuous positive public debt is not necessarily unsuitable, nor destabilizing provided the D_{it} is utilized to increase cost saving efficiency of production of public supplies.*

Policy Note:

If the strategic interdependence is taken care of, the optimal trajectories have to be studied using appropriate software and this would induce the policy-makers to move on to the optimal sequence of DF which then would indefinitely carry on towards the steady-state value, without jeopardizing the economy to unsustainability.

References

Alesina, Alberto and Roberto Perotti, (1995). "Fiscal expansions *and* adjustments in OECD countries," *Economic Policy*; 10, no. 2: 207-248.

Breton, A. (1996) Competitive Governments : An Economic Theory of Politics and Public Finance, Cambridge University Press, .

Buchanan, J. (1997) Review of Breton (1996) in Public Choice, 12-1997, Vol.93, Issue 3-4, pp 523-524.

Buiter, W. H. & U R Patel "Solvency & Fiscal Correction in India: An Analytical Discussion" in S. Mundle ed. *Public Finance Policy Issues for India,* Oxford University Press, 1997.

Chakraborti,P (1985). "An Innovating Firm In Oligopoly" *Arthaniti* (1982-83 issue).

Chelliah(1992) "Growth of Ibndian Pubklic Debt" in B.Jalan ed. The Indian economy, Penguin

Chelliah, Raja, J. "The nature of the fiscal crisis in the Indian Federation & Calibrating Fiscal Policy" ICRA, Jan-June (2000).

Easterly, W. and Klaus Schmidt- Hebbel(1993) "Fiscal Deficits and Macroeconomic Performance in Developing Countries" World Bank research Observer July, 1993.

George, K. K. & IS Gulati "Center state resource transfers, 1951-84: An Appraisal", EPW, 16 February,1985.

Gulati, I.S. "Tackling the Growing Burden of Public Debt" EPW, 1 May, 1993.

Jadhav and Neelankavil (2011), Deficit Financing – Causes, Consequences and Potential Cures Journal of Applied Business and Economics vol. 12(6) 2011 83

Johansen, L. ed.(1974) *Economics of Public Finance*

Krugman, Paul, (1979). "A Model of Balance-of-Payments Crises," *Journal of Money, Credit & Banking;* 11, no. 3, 311-325.

Krugman, Paul, (2010). "The Real Story," *The New York Times,* (September 2, 2010): B1. IMF (2010). Navigating the Fiscal Challenges Ahead, *IMF Staff Paper*, May 14, 2010.

Polimarchakis, H. A Critique of Theory of Economic Policy Exact reference is currently missing.

Rakshit, M. "On correting Fiscal Imbalances in the Indian Economy: Some perspectives ICPA-Money & Finance (July-Sept) Contentions Issues in Fiscal Policy A Suggested

Resolution" ICRA- Oct-Dec, (2000).

Starrett, David, A., *Foundations of public Economics*, Cambridge Economic Handbooks, Cambridge University Press,(1988)

Stein, Jerome L., (2005). "Optimal Debt and Endogeneous growth in models of International Finance," *Australian Economic Papers*, 44, no. 4, 389-413.

The Indian Inflation 2006–14: An Econometric Investigation

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Introduction

In the past few years, inflation continued to keep policy makers on a roller coaster ride as they had to keep the pace of growth on the right track especially during the recessionary phase. It was really difficult for policymakers as the different components of inflation were responsible for rise in prices at different points of time. Coupled with this, discussions are going on regarding the policy targets of the RBI, viz. whether India should go for inflation targeting or whether RBI should track CPI or WPI, headline or core inflation and so on. In order to conduct the monetary policy effectively, one has to know whether the change in prices is transitory or not. Now, whether the price rise is transitory or permanent depends on the change in the price of the component and the cause of that change. To understand the issues, it is pertinent to analyse the nature of inflation properly.

Rakshit (2011) examined carefully the nature of inflation that the Indian economy experienced during the period of first quarter of 2006 to second quarter of 2010, brought out a number of curious and baffling features of the observed price movements that caused important policy dilemma and made useful suggestions to resolve such policy dilemma. There were some other studies, too. Some of them dealt with the role of food inflation [Mishra and Roy (2011)]; Nair and Eapen (2012) conclude that majority of thecommodities were subject to inflationary pressures due to domestic supply-side constraints; Raj and Misra (2011) evaluate the performance of core inflation as the key inflation measure in the Indian context.

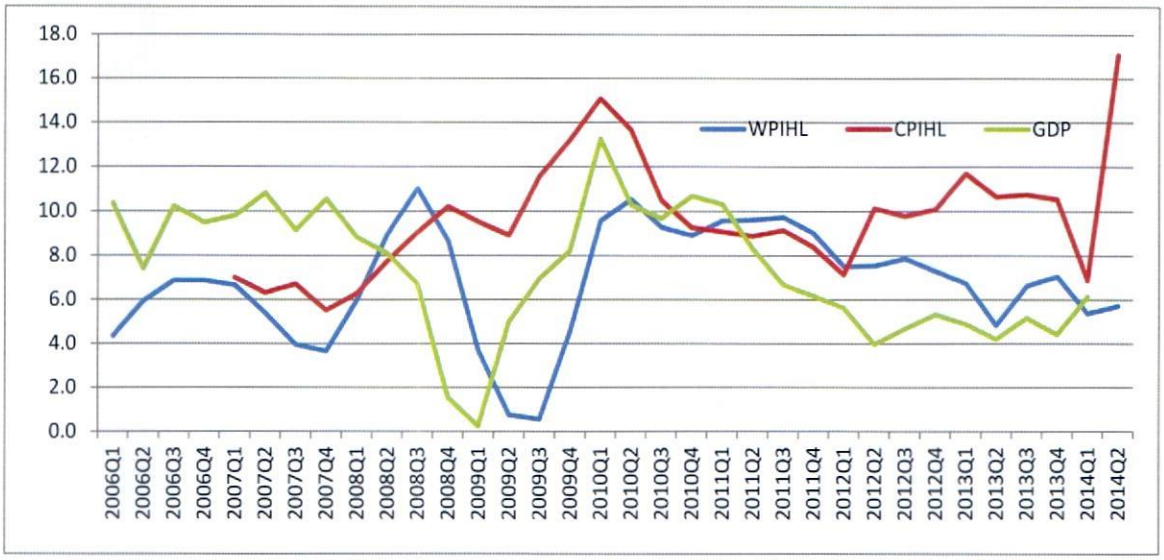
In this paper we try to figure out the nature of inflation, both WPI and CPI and both headline and core inflation. Given the findings of Rakshit (2011) from the structuralist viewpoint, we try to test the conclusions empirically and discern some definite conclusions about the movement of prices in India.

Major Features of Inflation: January 2006 –March 2014

Some of the interesting features of inflation in India observed are as follows:

1. Phasing of Inflation and GDP are different. From Figure 1, it can be observed that during the sample period, while GDP dipped into a recession and then started recovering gradually, WPI and CPI recorded different patterns varying from a cyclical one to highly increasing even when GDP was falling.
2. It is also observed that phasing of WPI and CPI are also not same. When WPI was cyclical in nature, CPI was high and increasing.
3. There are phases where the gap between WPI and CPI narrowed, even CPI remained lower at times, which is not very common.
4. Also, there is large divergence between WPI headline inflation and CPI headline inflation in terms of variation in prices of various component groups and their weights. For example, WPI headline inflation is more affected by food inflation while CPI headline inflation is influenced by fuel inflation [Rakshit (2011)].

FIGURE 1: Movement of GDP and Inflation in India



5. From Table 1, it is quite evident that the weights of food and fuel in WPI are different from that of CPI. This implies that adapting CPI or WPI as the target rate will have different implications for the economy. Since the two competing measures of inflation (Core WPI and Core CPI) followed divergent temporal patterns, which one should be used for policy purposes becomes a choice problem for the policy maker

(vide Taylor's rule followed by most monetary authorities for controlling interest rate, keeping eye on the observed rate of inflation and output trend[3]).

Table 1

Weights of Components in Inflation

Weights			
WPI Headline	100	CPI Headline	100
WPI Food	14.3	CPI Food	46.2
WPI Fuel and Power	14.9	CPI Fuel, Light, etc.	6.4
WPI Core	70.8	CPI Core	47.5
Of which		***Of which***	
WPI Manufacturing	65	Pan, Supari, Tobacco and Intoxicants	2.3
WPI Non Food and Minerals	5.8	Housing	15.3
		Clothing, Bedding and Footwear	6.6
		Miscellaneous Group	23.3

6. In addition to the observed characteristics, the policy debate in the context of inflation in India adds a different dimension to the present analysis. The debate has two aspects, viz. whether the policy maker should look at headline or core inflation and whether one should look at consumer price or wholesale price.
7. Some important observations by Rakshit (2011) include the following:

    a. The inflation was not macroeconomic as macroeconomic factors like growth rate of GDP and money supply failed to provide any explanation of the inflation indicated by y-o-y changes of Headline and Core WPI and CPI during 2006 to 2010.

    b. WPI and CPI Core inflations followed qualitatively different temporal patterns.

[3]The following relationship, known as Taylor Rule, is used for the purpose:

$i_t = \pi_t + r_t^* + a_\pi(\pi_t - \pi_t^*) + a_y(y_t - \overline{y}_t)$

Where i_t ; target short term nominal interest rate; π_t: measured rate of inflation; π_t^*: desired inflation; r_t^*: assumed equilibrium interest rate; y_t: logarithm of real GDP, and $\overline{y}_t$: logarithm of potential output as determined by a linear trend.

This may be indicative of the presence of a dichotomy between the roles of food and fuel prices in inter-sectoral transmission of inflationary impulses in the Indian economy[4].

c. CPI food inflation is found to be negatively related to the growth of agricultural GDP, but not related to the growth of non-agricultural GDP. Whereas the former confirms the supply-side story, viz., better agricultural performance abates food price inflation, the latter contradicts the structuralist view, viz., agricultural(food) supply being inelastic in short run, a rise in non-agricultural sector output (which accounts for 80 per cent of Indian GDP) should lead to a food price rise via increased food demand due to growth of non-agricultural output. Finally,

d. Exchange rate depreciation is found to produce a significant negative impact on the WPI Core and WPI manufacturing inflation – a result which is considered to be rather curious.

Scope, Objective and Methodology of the Present Exercise

Given the selected features of the recent Indian inflation enumerated above, our objective is to perform a time series econometric exercise, results of which may help us to discover meaningful temporal relationships among variables of a given sub-set. The objectives are:

- To find out existence of co-movements among the inflation and macroeconomic variables
- Role of components like food and fuel price in explaining CPI and WPI
- To find out the transmission of inflation components from one to the other

This study is based on monthly data for the sample period January 2006 to March 2014on the following 13variables:

[4]This possible dichotomy is explained as follows: For the Indian economy oil prices are autonomous, governed by international crude prices and government's petro-products pricing policies. Moreover, fuel users are not quantity-constrained. A fuel price shock will raise nominal prices of non-agricultural products, depending on the oil-intensity of the products. With money wages not responding to price increases, the oil price-shock induced inflation have no further consequences for non-agricultural prices. Since short-term supply of farm products are not affected by oil prices and the income and substitution effects of the rise in industrial (including fuel) prices on the demand for agricultural goods operate in the opposite direction, the impact of an oil shock on their prices could in theory be insignificant.

Price Index Nos.: Headline CPI (CPIH), Core CPI (CPIC), CPI Food (CPIFD), CPI Fuel (CPIFL), Headline WPI (WPIH), Core WPI (WPIC), WPI Food (WPIFD), WPI Fuel & Power (WPIFP);

Macroeconomic variables: Money Supply (M3), GDP[5], Agricultural GDP (GDPAG), non-agricultural GDP (GDPNAG), Exchange rate (EXR).

- For each of the above sets of variables, we first examine presence of unit root in the data generating process of individual variables by Phillips-Perron test. In this context we also apply Zivot-Andrews test to find out any structural break in the data[6]. If there is deterministic trend in the data, we remove the time trend, and check for stationarity for the residuals denoted as rCPIHL, rCPIFD etc. Then to find out whether there exists any co-movement or not, we apply Johansen cointegration test. If cointegration exists, we estimate VEC, if not, we estimate VAR with stationary series.

In the analysis, we consider the variables in the following 10 groups:

(1) CPIH, GDP, M3;

(2) CPIC, GDP, M3;

(3) WPIH, GDP, M3;

(4) WPIC, GDP, M3;

(5) CPIH, CPIFD, CPIFL, CPIC;

(6) WPIH, WPIFD, WPIF, WPIC;

(7) CPIFD, GDPAG, GDPNAG;

(8) CPIC, GDPAG, GDPNAG;

(9) WPIH, WPIFP, EXR; and

(10) WPIC, WPIFP, EXR.

Finally, the following VAR(1)-type model is estimated separately for each set of variables using data on year-on-year growth rates of the variables. For a 3 variable-set,VAR(1)-type equation set is of the form:

$$rx(t) = a_{01} + a_{11}rx(t-1) + a_{12}ry(t-1) + a_{13}rz(t-1) + \varepsilon_{1t}$$

[5]The monthly time series data on the three GDP variables have been constructed by repeating every quarterly value three times.

[6]For convenience, first, all the macroeconomic variables have been expressed in index number form, and then all the 13 variables have been expressed in logarithmic form.

$$ry(t) = a_{02} + a_{21}rx(t-1) + a_{22}ry(t-1) + a_{23}rz(t-1) + \varepsilon_{2t}$$

$$rz(t) = a_{03} + a_{31}rx(t-1) + a_{32}ry(t-1) + a_{33}rz(t-1) + \varepsilon_{3t}$$

where rx*(t), ry(t), rz(t)*: residuals for variables*x, y, z* for time point t.Needless to mention, estimates of this type of equations should help examine, Granger-type causality between residuals (after removing time trend, if any) of pairs of variables. Let us next turn to the estimated results.

Results

It may be noted that the ten sets of variables mentioned above have been specified with the objective of examining further one or the other features of the current inflationary process listed above. Thus, e.g., analyses based on sets (1) and (2) should help examine if macroeconomic factors are at all relevant. In what follows, we present the results in a somewhat classified manner.

- **Relevance of Macroeconomic Factors**: Generally inflationary price rise is understood to be a macroeconomic phenomenon and indicators of overall excess demand like growth rates of GDP, narrow money and broad money are taken as its explanatory factors. From Table 2, it is evident that Headline inflation is not explained by macroeconomic factors. However, there are signs that WPI and CPI core inflation are affected by Money Supply.

Table 2

Role of Macroeconomic Variables

	Variables	Conclusion (VAR)	Granger Causality	Impulse Response
1	**rCPIHL, rM3, GDP**	**rM3(-ve) wrt CPIHL, CPIHL (+ve) wrtrM3**	**No causality with rCPIHL**	
2	**rCPICORE, rM3, GDP**	**no effect of rM3 or GDP on rCPICORE**	**rM3 causes rCPICORE**	**Impulse response of rCPICORE due to rM3 positive and divergent**
3	**rWPIHL, rM3, GDP**	**rM3 (-ve) wrt WPIHL**	**rWPIHL causes rM3**	
4	**rWPICORE, rM3, GDP**	**No effect of rM3 or GDP on rWPICORE**	**rM3 causes rWPICORE**	

Role of Food and Fuel & Power Price Inflation in WPI and CPI Inflation: In Professor Rakshit's analysis, CPI food inflation is found to explain well the corresponding Headline and Core inflation. While for the Headline inflation this is quite expected as food prices have 46.2 per cent weight in the overall Headline CPI, the explanation of Core inflation in terms of corresponding food price inflation, Professor Rakshit pointed out, is unacceptable as food prices are not autonomous in the Indian economy. He therefore sought explanation of CPI food price inflation, and hence of corresponding Headline and Core inflation, in terms of GDPAG and GDPNAG. Moreover, current and one-period lagged fuel prices were found to affect WPI Headline and Core inflation. However, the estimated impact of WPIFP on WPIC was found to be negative.

TABLE 3

Role of Food and Fuel Price Inflation				
	Variables	Conclusion (VAR)	Granger Causality	Impulse Response
5	rCPIHL, rCPIFD,rCPICORE	rCPIFD (-ve) wrt rCPICORE; rCPIHL (+ve) wrt rCPIFD & rCPIFL	causality from rCPIFD and rCPICORE to rCPIHL; rCPICORE to rCPIFD	
6	rWPIHL, rWPIFL,rWPICORE	explained by only own past values	causality from rWPIFP and rWPICORE to rWPIHL; rWPICORE to rWPIFD & rWPIFP	

From Table 3, our analysis reveals that CPI headline inflation is caused by CPIFD and CPI Core, but WPI headline inflation is caused by WPIFP and WPI Core.

Relationship of CPI Food Price Inflation with Changes in GDPAG and GDPNAG:

In Rakshit (2011),as the estimated coefficient of GDPNAG is non-significant in all the equations, the results negate the structuralist view that in the Indian economy a rise in non-agricultural GDP would create an excess demand for food in the short run and hence result in a rise in food price. In our analysis, it is observed that agricultural income increase leads to CPI Food inflation and fuel price increase leads to CPI fuel inflation [Table 4].

TABLE 4

Explanatory Factors of CPI Food and WPI Fuel Inflation				
	Variables	Conclusion (VAR)	Granger Causality	Impulse Response
7	rCPIFD, GDPAG, GDPNAG	rCPIFD wrt GDPAG(t-1) +ve, but GDPAG(-2) -ve	GDPAG causes GDPNAG and CPIFD; CPIFD causes GDPNAG	
8	rCPICORE, GDPAG, GDPNAG	explained by only own past values	GDPAG to rCPICORE; GDPAG causes GDPNAG	
9	rWPIHL, rWPIFP, dEXCHRT	r'WPIHL wrt rWPIFP (+ve)	dExchrt causes rWPIFP	initially negative, after 6 months positive impact, dies down by 13-14 months
10	rWPICORE,r WPIFP, dEXCHRT	rWPIFP wrt dExchrt (+ve)	dExchrt causes rWPIFP	-

Conclusion

In this study we have presented results of a time series econometric analysis of the inflation experienced by the Indian economy during the January 2006 – March 2014 period. We examined the nature of inflation by using some basic time series econometric techniques on a database of monthly observations on the set of relevant variables. While many of our results corroborate Professor Rakshit's observations, there are some which suggest that a deeper empirical probe may help resolve some of the counter-intuitive results. In sum, this study, when completed, may give a more comprehensive and complete analysis of the recent Indian inflation experience.

Reference

Mishra, Prachi and DeveshRoy (2011), Explaining Inflation in India: The Role of Food Prices,Brookings-NCAER India Policy Forum, Volume 8, 2011-12

Nair,Sthanu Rand Leena Mary Eapen (2012), Food Price Inflation in India (2008 to 2010): A Commodity-wise Analysis of the Causal Factors, *Economic & Political Weekly*, volXLVII, no 20, May 19.

Raj, Janak and SangitaMisra (2011), Measures of Core Inflation in India– An Empirical Evaluation, *RBI Working Paper Series*, W P S (DEPR) : 16 / 2011, RBI.

Rakshit, Mihir (2011), Inflation and Relative Prices in India 2006-10: Some Analytical and Policy Issues, *Economic & Political Weekly*, volXLVI, no 16, April 16.

Policy Intervention, Resilience of Natural: Resources and Economic Growth

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Abstract

Economic growth results in degradation of natural resources and environmental quality. For conservation of land, water, forest, minerals, ecology and environment policy intervention of the government and public investment have important role. Since resource management has externality problems, measures for resource conservation will not be undertaken by the private agents in a decentralised system. This paper demonstrates with theoretical models that policy intervention and public investment can increase the resilience of natural resources and ensure a balanced sustainable growth in an endogenous framework.

INTRODUCTION

In traditional growth theory accumulation of physical capital and exogenous technical progress are considered to the driving force of economic growth. Human capital formation, R&D expenditures and endogenous technological progress play important role in endogenous growth theory. However, the use and conservation of natural capital have become very important for sustainability of growth in the recent time. The expansion of economic activities leads to soil degradation, over exploitation of ground water, deforestation, carbon emission, loss of biodiversity which not only result in environmental degradation but also put a threat to future growth. The individuals derive utility from consumption and environmental quality. But degradation of natural resources questions the viability of both future consumption and environmental quality. Natural capital plays an important role in production and it includes energy resources (oil, gas, etc.), mineral resources, timber and non-timber resources, cropland, pastures and protected land areas. Produced capital on the other hand includes machinery, equipment, structures and urban land. Therefore conservation of natural capital specially renewable resources like land, forest, water and waterbodies, ecology has become very crucial for future growth. By 'Green Growth', we mean sustainable growth without harming natural resources and environmental

standard. Over exploitation of ground water and excessive use of chemical fertilisers in agriculture, deforestation for agricultural and industrial activities, carbon emission from fossil fuel and loss of biodiversity have become the matters of serious concern for sustainable growth.

The sectorwise greenhouse gas emissions are as follows: 26% by power, 19% by industry, 17% by land use change and forestry, 14% by agriculture and 13% by transportation (World Development Report, 2010). Power generation (mainly from fossil fuel) and industrial activities account for nearly 50% of carbon emission. The carbon emission at the global level has increased by 28.3% over the period from 1990 to 2005 and in the middle income countries, it is 38%. The consumption of electricity has increased by 30% during this period. In middle income countries, this rate is 58%. The main sources of this electricity is thermal power which is exhausting the stock of non-renewable energy resources like coal, natural gas and mineral oils and at the same time it is emitting excessive carbon in the air. The per capita natural capital at the global level is 4011 dollar against 16850 dollar of produced capital. The decline of natural capital and degradation of the environment are important causes of global warming and climate change. The projected impact of climate change on agricultural productivity in India, Pakistan and China are – 12.2%, – 32.9% and 8.4% respectively from 2000 to 2050. It is interesting to note that agricultural productivity is declining or remains stagnant due to change in resource stock and climate change (World Development Report 2010).

The countries in East and South East Asia have achieved remarkable success in foodgrains production in the last few decades but at the same time intensification in cultivation has brought environmental problems of its own. Excessive use of ground water and use of agrochemicals in increasing amounts pollute waterways, poison people and upset ecosystem. The intensive agriculture has caused soil degradation in the form of salinization and loss of soil organic matters (Sasmal and Weikard, 2013). In most of the Indian states depletion of ground water is very high and in some states it has crossed the permissible limits of nature. Romer (2001) and Jones (2002) have shown how growth rates decline due to decline in resource stock.

So far as conservation of natural resources is concerned, various policy measures have been suggested. In addition to regulatory measures in the form of taxes and subsidies, technological progress and scientific innovations can be of great help in this matter. Produced capital and technological progress can be substitutes for natural capital (Solow, 1974). Stiglitz (1974) also demonstrates that resource augmenting technical change can offset the constraints of natural resources. Sasmal and Weikard show that policy intervention of the government can increase the range of resilience of soil fertility to agricultural growth. Harrington, Khanna and Zilberman (2005) show that use of conservation capital can ensure a balanced sustainable growth. Sasmal (2013) shows that crop-diversification in favour of water-saving crops can be helpful for conservation of water resources. So, necessary investment and appropriate technological process can be of much help in sustaining growth and maintaining environmental quality. The private agents make under valuation of natural resources and make excess use of them. On the other hand, conservation of natural resources has externality problems. Naturally, resources are not preserved at private initiatives. The objective and argument of this paper is that policy intervention and public investment can help conservation of resources thereby maintaining sustainable growth. Sometimes, it becomes a social planner's problem to trace out the optimal path for public investment so that a sustainable balanced growth is ensured. This paper has constructed a theoretical model to show that resource degradation in a decentralized system makes growth unsustainable in the long run. Policy intervention and public investment increase the resilience of natural resources and makes growth sustainable in the long run.

THE MODEL

Let us consider the production technology in a decentralized system as

$$Y = F(N, K, Z) \tag{1}$$

where Y is output, N is natural resource, K is physical capital and X is the set of variable inputs. The function is characterised by $F_N > 0$, $F_{NN} < 0$, $F_K > 0$, $F_{KK} < 0$ and $Y_Z > 0$, $Y_{ZZ} < 0$. To be specific, N may be considered as a renewable resource and it has a logistic growth function as follows :

$$G(N) = rN\left(1 - \frac{N}{\bar{N}}\right) \tag{2}$$

where r is intrinsic rate of growth of the resource. Z may be conceived as a polluting input or it may be simply considered as volume of economic activities that affects the resource stock and environmental quality. The use of Z causes depletion of N and the depletion function is

$$h = h(Z),\ hz > 0,\ hzz > 0$$

The dynamics of N is

$$\dot{N} = G(N) - h(Z) \tag{3}$$

Since use of Z causes resource degradation it causes environmental degradation also. Let E be the environmental quality and it has some natural assimilative capacity. The natural growth function of E is $\psi(E)$. As in (3) the dynamics of E can be written as

$$\dot{E} = \psi(E) - P(Z) \tag{4}$$

where P is pollution from Z and $P'(Z) > 0$ and $P''(Z) > 0$.

The utility function of the household is

$$U = U(C, E) \tag{5}$$

where C is consumption and E is environmental quality. The function is characterized by $Uc > 0$, $Ucc < 0$, $UE > 0$ and $UEE < 0$. The environmental quality is a public good and the individual household can not influence it. So, it drops out of the utility function. Now, the utility function can be written as

$U = U(C)$ with same specifications. The private agent disregards the environmental effects of X.

The dynamics of K can be written as

$$\dot{K} = Y - C - pZ \tag{6}$$

where p is given price of Z. Although Z has negative externalities, there is no provision for taxes for on the use of Z. The objective of the household is :

$$Max \int_0^{\infty} U(C)\, e^{-\rho t} \cdot dt \tag{7}$$

s.t. (3) and (6)

$K(0) = K_0$, $K(T)$ free

$$\lim T \to \infty$$

$$N(0) = N_0, \quad N(T) \geq N_{min}$$

$$\lim T \to \infty$$

Here, ρ is the rate of discount of future utility.

The dynamic optimization problem in (7) can be solved using the optimal control theory as outlined in Chiang (1992) and Dorfman (1969). The current value Hamiltonian is

$$H = U(C) + \lambda_K [Y - C - pZ] + \lambda_N [G(N) - h(Z)]$$

Here, control variables are C and X and State Variables are K and N. λ_K and λ_N are current value shadow prices of K and N respectively.

The first order conditions for maximising H are :

$$\frac{\partial H}{\partial C} = U_C - \lambda_K = 0 \tag{9}$$

$$\frac{\partial H}{\partial Z} = \lambda_K Y_Z - \lambda_K p - \lambda_N h'(Z) = 0 \tag{10}$$

$$\text{Or,} \quad Y_Z = \frac{\lambda_N}{\lambda_K} \cdot h'(Z) + p \tag{10}$$

$$-\frac{\partial H}{\partial K} = \dot{\lambda}_K = \rho \lambda_K - \lambda_K Y_K \tag{11}$$

$$-\frac{\partial H}{\partial N} = \dot{\lambda}_N = \rho \lambda_N - \lambda_N Y_N \tag{12}$$

Transversality conditions are :

$$\lambda_K(T) \geq 0, \quad \lambda_K(T) K(T) = 0$$

$$\lambda_N(T) \geq 0, \quad \lambda_N(T) N(T) = 0$$

$$\lim T \to \infty$$

The second order conditions are satisfied by strict concavity of H in C, Z, K and N jointly. Now the resulting equations (9) – (12) and transversality conditions will give optimal solution to this dynamic optimisation problem.

The condition (9) can be written as

$$U_C = \lambda_K \tag{9}'$$

Taking differentiation w.r.t. time (9)′ can be expressed as

$$U_{CC} \cdot \dot{C} = \dot{\lambda}_K \tag{13}$$

Putting the value of $\dot{\lambda}_K$ in (11), we get

$$-\frac{U_{CC}}{U_C} \cdot C \cdot \frac{\dot{C}}{C} = Y_K - \rho \tag{14}$$

where $-\left(\frac{U_{CC}}{U_C} \cdot C\right)$ is intertemporal elasticity in consumption denoted by θ.

After simplification, (14) can be expressed as

$$g_C = \frac{\dot{C}}{C} = \frac{1}{\theta}\left[Y_K - \rho\right] \tag{15}$$

where g_C is growth rate of consumption and this is standard result of optimal growth rate in endogenous framework.

The first order conditions have important economic implications. Equation (9) signifies that optimal consumption at each point of time will be determined at a level where marginal utility of consumption is equal to the shadow price of K. It resolves the trade-off between consumption and investment for capital accumulation and future consumption. Equation (10) determines optimal use of Z at each point of time. It equates marginal returns to Z with its price (p) and value of loss of natural resources. The private agent ignores the environmental cost of using Z. So, there will be market failure due to externality problems and optimal value of Z may exceed its sustainable value. That means,

$$h(Z) > G(N) \text{ and } \dot{N} < 0.$$

In effect, there will be gradual decay of the resource stock which will make growth unsustainable in the long-run. Jones (2002) and Romer (2001) have shown that the growth rate of non-renewable resource will be negative causing exponential decay of the resource

stock over time. In our case of renewable resource, stock will decline but may not be at an exponential rate.

Following Sasmal and Weikard (2013) we may write $h = h\{Z(N, \lambda_N, \Omega)\}$ where Ω is set of parameters. That means, depletion of resource will depend on the stock of the resource, the shadow price of the resource and set of parameters like input price, discount rate of future utility etc. Given the parameters, the depletion of resource (h) can be expressed as a positive and linear function of N under certain plausible assumptions.

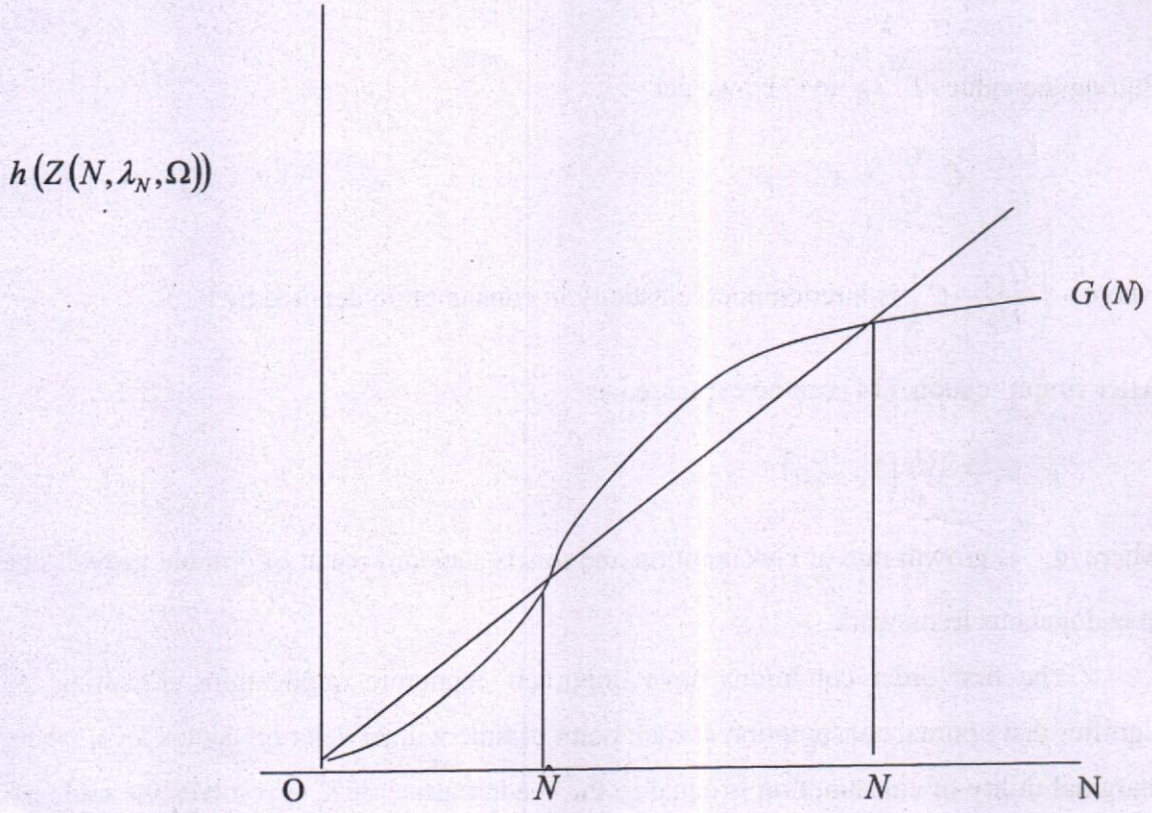


Figure 1.

In a decentralized system, if $h(Z) > G(N)$, $\dot{N} < 0$. Since the resource structure is non-convex, we have multiple equilibria. For low stock of the resource i.e. for $N < \hat{N}$, $h(Z) > G(N)$, the system collapses. It is a remote possibility that natural resource will stabilise at a very high level i.e., $N \geq \bar{N}$. So, resource degradation with unsustainable growth is a very natural outcome in a decentralized system. So, growth rate in (15) may not be sustainable.

Let us consider the production function in Cobb-Douglas form as

$$Y = AN^{\alpha} K^{\beta} Z^{1-\alpha-\beta} \tag{16}$$

Taking log of the function in (16) and differentiating w.r.t. time, we get

$$g_Y = g_A + \alpha g_N + \beta g_K + (1-\alpha-\beta) g_Z \tag{17}$$

where g is growth rate of j and $j = Y, A, N, K, Z$.

Here, $g_A = 0$ and $g_N < 0$, because A is constant and N is declining.

Therefore, growth rate of Y in (15) may decline due to resource degradation if the value of α is very high. α is the production elasticity with respect to N. Along with resource degradation there will be environmental degradation also in a similar process. Here, $P(Z) > \psi(E)$ making $\dot{E} < 0$.

By green growth, we mean that conservation of natural resource and environmental quality are maintained at constant levels, that is, $\dot{N} = 0$ and $\dot{E} = 0$. But in a decentralized system, this is not feasible without government intervention. The private agents make under valuation of natural resources and use of resource exceeds sustainable limit due to externality problems. Besides, works for conservation of forests, water, fishing ground, land and ecology are of public good nature. So, without public intervention such activities can not be done. The government can impose taxes on the use of natural resources and polluting inputs. Lump sum taxes may be collected to make investment for conservation of natural resource or for enhancement of their efficiency. The tax revenues can be utilized for conservation of natural resources and the environment. Suppose, use of Z is taxed at the rate of τ. So, the tax proceeds is equal to $\tau \cdot Z = T$ where T is tax revenue from the polluting inputs and it is used for investment on conservation of natural resources denoted by I and I helps regeneration of N.

Now the dynamics of K and N changes to

$$\dot{K} = Y - C - pZ - \tau Z$$

$$\dot{N} = G(N) - h(Z) + \eta(I)$$

$\eta(I)$ is resource generation from public investment I. Here, $\eta'(I) > 0$, $\eta''(I) < 0$.

After policy intervention equation (10)′ changes to

$$Y_Z = \frac{\lambda_N}{\lambda_K} \cdot h'(Z) + p + \tau \qquad (18)$$

As additional cost is added to the price of Z, the use of Z will decline with the result that h (Z) curve may shift downward. On the other hand, as η (I) is added to G (N), the natural regeneration function G (N) will shift upward.

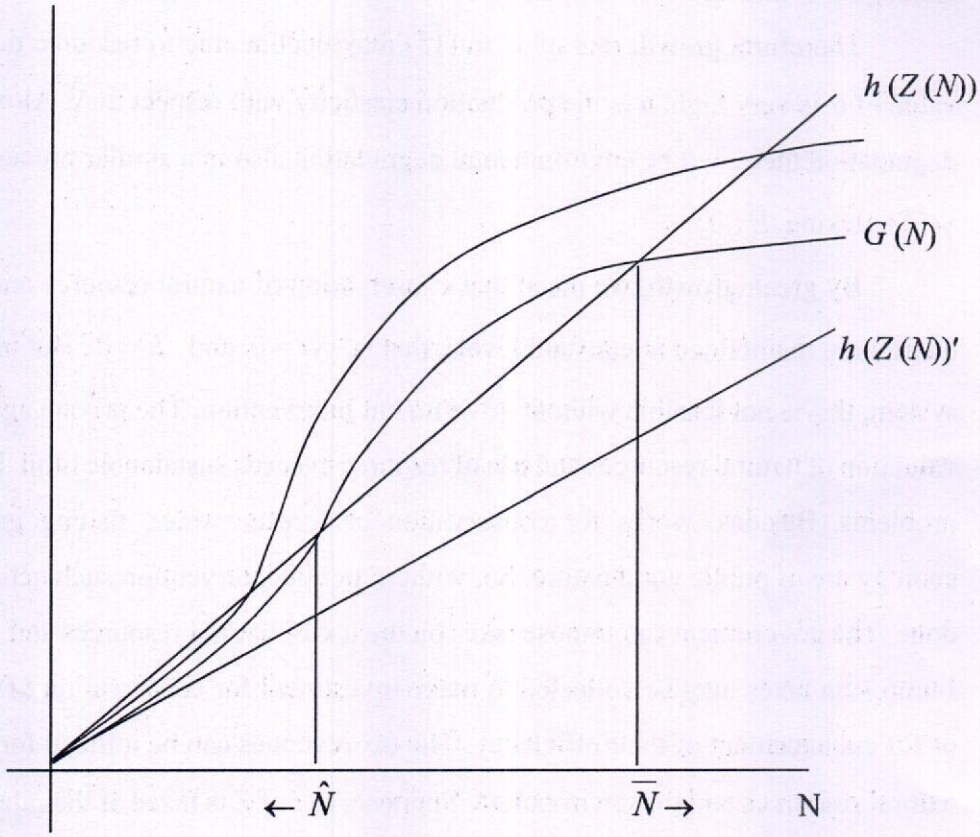


Figure 2.

As a result, the range of resilience of natural resource to economic growth increases from $\hat{N}\,\overline{N}$ to $\hat{N}_1\,\overline{N}_1$. If the effect of public investment on the regeneration of resource is sufficiently strong, the intersection of the two curves at the low level may be avoided and this will make the system fully resilient. As a result of public investment, G (N) exceeds h (Z) over a long range of N and finally N becomes stationary at the maximum value of the resource stock $\overline{N}$. Then $\dot{N} = 0$ is maintained at the maximum value and it is stable.

As $\dot{N} = 0$ at maximum level of N,

$$G(N)+\eta(I)=h(Z) \tag{19}$$

Total differential of (19) gives

$$G'(N)dN+\eta'(I)dI = h'(Z)dZ$$

or, $$G'(N)\cdot\frac{N}{G}\cdot\frac{dN}{N}\cdot G+\eta'(I)\cdot\frac{I}{\eta}\cdot\frac{dI}{I}\cdot\eta = h'(X)\cdot\frac{Z}{h}\cdot\frac{dZ}{Z}\cdot h$$

or, $$\varepsilon_N\cdot g_N\cdot G+\varepsilon_I\cdot g_I\cdot\eta = \varepsilon_Z\cdot g_Z\cdot h \tag{20}$$

Here, ε_N is elasticity of resource generation in a natural process. Similarly, ε_I is elasticity of resource generation w.r.t. public investment and ε_Z is elasticity of depletion of natural resource w.r.t. Z. g_N, g_I and g_Z are growth rates of N, I and Z respectively. In balanced growth, $g_N = g_I = g_Z$.

If $\dot{N}=0$ and $g_I = g_Z$.

or, $$g_I\left(\varepsilon_I\cdot\eta-\varepsilon_Z\cdot h\right)=0$$

or, $$\frac{\varepsilon_I}{\varepsilon_Z} = \frac{h}{\eta} \tag{21}$$

From (19) $h > \eta$. So, in (21) $\varepsilon_I \rangle \varepsilon_Z$. That means, if $\dot{N}=0$, from equation (19) it follows, elasticity of resource generation from public investment (ε_I) will be greater than the elasticity of resource depletion from the use of Z. Thus public investment can stop degradation of resource stock and maintain it at the maximum level.

For sustainable balanced growth all the factors will have to grow at the same rate. Then resource stock can increase in efficiency terms. There should be technological progress to enhance efficiency of resource. But investment for such technological progress may be made by the government from collection of additional tax denoted by M.

Let the technological progress for enhancing productivity of natural capital be denoted by $e(M)$. $e'(M)\rangle 0, e''(M)\langle 0$. Here $e(M)$ and N are perfect substitutes. Balanced growth is feasible if production function exhibit constant returns to scale (Harrington et al., 2005). The production function can be changed to

$$Y = A\left\{e(M)\cdot N\right\}^{\alpha} K^{\beta} Z^{1-\alpha-\beta} \tag{22}$$

The dynamics of K changes to

$$\dot{K} = Y - C - pZ - \tau Z - M \tag{23}$$

The solution to this dynamic optimization problem will now determine optimal values of C and Z at each point of time. It will also trace out the path for optimal public investment so that sustainable balanced growth is ensured.

Taking log of (22) and differentiating w.r.t. time, we get

$$g_Y = \alpha\, g_M + \beta\, g_K + (1-\alpha-\beta) g_Z \tag{24}$$

Equation (24) gives the sustainable balanced growth where $\dot{N} = 0$ and $g_Y = g_M = g_K = g_Z$

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Summary

In traditional growth theory accumulation of physical capital and exogenous technical progress are considered to be the main driving force of economic growth. Human capital formation and endogenous technological progress play important role in endogenous growth theory. Natural capital does not receive much attention in recent growth theory although natural resources like land, water, forest, minerals, ecology and environment are very important for sustainability of economic growth. Private individuals make under valuation of natural resources and as a result, market failure takes place resulting in degradation of natural resources. This makes growth unsustainable in the long run. Natural resources are of public good nature and they have externalities. So, measures for conservation of natural resources are not undertaken at the individual level. Policy intervention of the government through taxes and subsidies and public investment for technological innovations can help both conservation of resources and sustainability of growth. This paper demonstrates theoretically that public intervention can reduce the use of resource-damaging inputs and encourage public investment for conservation of natural resources thereby increasing the resilience of natural resources. As a whole, sustainable balanced growth is ensured in the economy.

References

Chiang, A.C. (1992), 'Elements of Dynamic Optimisation', McGraw Hill Inc., New York.

Dorfman, R. (1969), "An Economic Interpretation of Optimal Control Theory", American Economic Review, 59.

Harrington, D.R., Khanna, M. and Zilberman, D. (2005), "Conservation Capital and Sustainable Economic Growth", Oxford Economic Papers, 57.

Jones, C. (2002), "Introduction to Economic Growth", W.W. Norton & Company.

Romer, D. (2001), "Advanced Macroeconomics", McGraw Hill.

Sasmal, J. and Weikard, H.P. (2013), "Soil Degradation, Policy Intervention and Sustainable Agricultural Growth", Quarterly Journal of International Agriculture, 52(4).

Sasmal, J. (2013), "Crop-Diversification for Conservation of Water Resource and Agricultural Growth : A Comparative Dynamic Analysis", South Asian Journal of Macroeconomics and Public Finance, Sage Pub.

Stiglitz, J. (1974), "Growth with Exhaustible Natural Resources : Efficient and Optimal Growth Paths", Review of Economic Studies.

Solow, R.M. (1974), "Intergenerational Equity and Exhaustible Resources", Review of Economic Studies.

World Development Report (2010).

of mangrove forest by the local community and their attitude towards its conservation. Valiela *et al.*(2001), Barbier and Cox (2003), Barbier (2007), and Sathirathai & Barbier (1998) empirically estimated the mangrove-fishery linkages in South - East Asia and in other countries. These studies show that conserving mangrove for shrimp cultivation was financially attractive but this does not make conversion of mangrove into commercial fishing pond economically worthwhile.

In India the protection services of mangrove forest has been studied by Das (2009a, 2009b). She estimated the value of the protection services that mangrove provide in terms of property loss in the Kendrapada district of Orissa. These studies highlight the extent of damage in a particular area depends on the intensity of the cyclone (reflected in wind velocity and storm surge) as well as on the physical and socio-economic features of the area, viz. location of the village vis-a vis the coast line, the cyclone eye, the presence of mangroves or other cyclone barriers etc., can help reduce the cyclone impact. In a similar study Das (2012) examined the role of natural ecosystem and socio- economic factors in the vulnerability of coastal villages to cyclone and storm surge by calculating the probabilities of expected human fatality due to severe cyclone. The results show villages established in mangrove habitat areas and those with more marginal workers face a very high death risks. But those villages which are situated inside the existing mangrove forest or near a major river, found to be facing much lower risks of deaths. This paper has important implications like conserving mangrove forest in cyclone prone areas, priority evacuation of villages established in the mangrove habitat before high intensity cyclone etc. for cyclone hazard management.

So far a lot of empirical work has been done to estimate their value in supporting fishery, promoting tourism and providing livelihood to local people and protecting the coastal region from natural disasters like tsunami and cyclones. However, not much theoretical work has been done in this area. The valuation techniques generally used like the production function approach, or the travel cost method look at only some specific use of mangrove forest like supporting fishery or promoting tourism. In this paper, we propose a general equilibrium structure that will help analyze the role of mangrove forests and economy-ecology inter-linkages in its entirety.

Role of Mangrove Forests – A Theoretical Approach

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Abstract

This paper is an attempt to provide a theoretical background to the economy-ecology linkages in the mangrove forest area and tries to capture the role of these forests in terms of economic linkages and the protection services they offer. It studies how market forces lead to the destruction of these forests and tries to find economic and environmental policies which will help in their preservation. The issue is addressed through a general equilibrium model where the extraction of timber promotes the economy but at the same time this results in a loss in productivity in the fishery sector. The impact of economic fluctuations and natural calamities on the economy and the forest cover and the economy-ecology interaction may be analysed in this context. We hope that such a model will help studies on the complete evaluation of the forests in the future.

Key words: General equilibrium, Mangrove – fishery linkage, Protection service)

I. Introduction

Mangrove forests serve as a natural breeding ground of shrimps and offshore fisheries. It also support fishery which provides a good amount of foreign exchange from shrimp cultivation and serves as a source of livelihood to many living in and around these forests. The biodiversity in mangrove ecosystems attract a lot of tourists and is another source of livelihood. In the last two decades, another very important role of the mangrove forests has been widely discussed – the protection they offer from natural disasters like super cyclones and tsunamis. Capturing or estimating the role of the mangrove forests in the ecosystem presents a huge challenge. Though there have been a lot of empirical studies on this issue, most of them are piece meal studies and focus on one or some role of these forests.

Badola et al (2011) studied the attitude of local communities towards conservation of mangrove ecosystem in the east coast of India. This study, though conducted with the protection service of mangrove forest as its backdrop, mainly concentrates on the direct use

The rest of the paper is organized as follows: in section II we briefly discuss the mangrove forest, in section III we describe our model and in section IV we discuss some comparative static analysis that may be done to analyze the direct and indirect role of the mangrove forests, including the protection services they offer and finally, in Section V, we conclude the paper.

II. The Mangrove Forests

Local use (direct & indirect) of mangrove forest resources is varied and significant, and includes timber for construction, fuelwood, charcoal, logs & wood chips, tannins & dyes.

Mangrove forest has two forest types – "production forest" and "unproductive forest" (Othman et. al., 2004). The forest is "productive" in the sense it is used directly for the production of timber which is mainly used for charcoal production, construction and fuelwood. The "unproductive" forest comprise of the rest of the mangrove forest cover, not directly used in production. In Malaysia, this unproductive part is approximately only around 20% of the total mangrove cover. This forest mainly provides environmental protection & conservation functions. It comprises three main compartments: a) Dryland forest, b) new forest, c) functional forest. The dryland forest provides shelter for agricultural crops & houses next to a mangrove forest. The new forest stabilizes new mudflats in the coastal & estuarine areas. Mudflats are areas in which many species of fish, prawns, shellfish & other marine fauna spawn and feed. Mudflats are also used as culture beds for cockles. Mudflats along the mangrove forest shores near creek are refuelling & roosting sites for large number of migratory birds. The new forest also provides a food source for fruit bats that pollinate durian flowers. The functional forest includes virgin jungle reserves, research forest, archaeological reserves, bird sanctuary, ecotourism forest & educational forest.

Roots and stems of intact mangrove forests, sea grass beds & benthic algae provide shelter, habitat and sources of food for juvenile stages of numerous marine creatures (e.g. fish, prawn, crab & molluscs), many of which are economically important to coastal fishing communities. For example, an inter-tidal system including intact mangrove forest provide essential spawning habitat for a number of species, including milkfish (*chanoschanos*) and prawn (*penaeusmonodon&P. merguiensis*). Some community members, living in and around a mangrove forest, have identified a range of economically important product

associated with intact mangrove ecosystem that can be harvested by both men and women (fire wood, building materials, charcoal, dye, anchors for boats, joints for boat stabilizing, fish, shrimp, eel, clam, crab, sea snail etc.), many of which provide important sources of food and household income.

III. The Model

To capture the role of the mangrove forests and the ecology – economy linkage, we use a static general equilibrium model where there are two sectors producing two traded goods which depend on the mangrove forests - timber (T) which is produced by cutting down the trees (and thus destroying the mangrove cover) and another good say shrimp/ fishery (F)– which needs the mangrove cover for better production. As the mangrove forest decays output of fishery sector falls and vice versa. Both the sectors use unskilled labour (L) and capital (K) as their primary inputs of production. Labour and capital are perfectly mobile across sectors and fully flexible. This ensures full employment of both labour and capital. The stock of mangrove forests or the mangrove cover is captured by the variable S which falls as the production of timber increases.

The production technology in each sector is assumed to have constant return to scale with positive but diminishing marginal return to each factor of production. While the total mangrove cover has no impact on the timber production as long as the entire forests are not destroyed, its effect on the fish production is captured through the *"productivity effect"* of both factors. A greater mangrove cover results in greater concentration of fish and enables greater catch per unit of labour and capital. Thus the input coefficients of the two sectors can be written as

$$a_{LT} = a_{LT}(w/r) \quad \& \quad a_{KT} = a_{KT}(w/r) \tag{1}$$

$$a_{LF} = a_{LF}\left(\frac{w}{r}, S\right) \quad \& \quad a_{KF} = a_{KF}\left(\frac{w}{r}, S\right) \tag{2}$$

We assume that the productivity effect on the two factors are identical, and captured by μ such that

$$\mu = {a'_{LF}}/{a_{LF}} = {a'_{KF}}/{a_{KF}} < 0 \tag{3}$$

Prefect competition prevails in product as well as in factor market, which implies that the international commodity prices P_T^* and P_F^* reflect equal the unit cost of production in each sector.

$$P_T^* = a_{LT}\left(\frac{w}{r}\right)w + a_{KT}\left(\frac{w}{r}\right)r \tag{4}$$

$$P_F^* = a_{LF}\left(\frac{w}{r}, S\right)w + a_{KF}\left(\frac{w}{r}, S\right)r \quad (5)$$

where w and r are the wage rate and return to labour, respectively.

As the stock of mangrove forests are adversely affected by the production of timber,

$$S = S(X_T); \quad S' < 0 \quad (6)$$

Full employment condition of labour and capital are:

$$L = a_{LT}\left(\frac{w}{r}\right)X_T + a_{LF}\left(\frac{w}{r}, S\right)X_F \quad (7)$$

$$K = a_{KT}\left(\frac{w}{r}\right)X_T + a_{KF}\left(\frac{w}{r}, S\right)X_F \quad (8)$$

The income of the economy can then be written as

$$y = P_T^* X_T + P_F^* X_F \quad (9)$$

Thus, this static general equilibrium model captures a snapshot view of the ecology-economy inter-linkage where the expansion of one sector (timber) actually harms the other sector (fishery) directly through the productivity effects. The protection services provided by these forests are generally not visible, and are observed only when some disaster occurs. Thus, they are not directly included in the snapshot view of the economy, and incorporated through some equations of change (which occur due to disasters) and discussed in the next section.

IV. Comparative static analysis – A discussion

The effect of economic fluctuations and natural disasters on the output of the two goods, mangrove cover and income can be studied using the framework discussed in the previous section and is the focus of our ongoing research. Economic fluctuations in the international commodity markets result in changes in commodity prices. We will study how these price changes affect the production and hence, the mangrove cover. The production changes will depend to a certain extent on the assumptions of relative factor intensity of the two sectors. The standard results are altered under certain circumstances due to the presence of the productivity effect.

Natural disasters like storms, cyclones and tsunamis are incorporated in this framework through loss of capital and labour. While minor storms and cyclones cause damage to property (in this model capital supply falls), super cyclones and tsunamis cause extensive damage to property and loss of life (both capital and labour supply falls). The protection

service offered by the mangrove forests become important in these situations. In areas where the forests are extensive, there is less damage to capital and labour. Thus, the fall in capital and labour supply depends on the stock of mangrove forests and can be expressed as

$$\hat{K} = k(S); \quad k' < 0 \text{ and } \hat{L} = 0 \text{ for minor disasters}$$

while $$\hat{K} = k(S); \quad k' < 0 \text{ and } \hat{L} = l(S); \quad l' < 0 \text{ for major disasters}$$

V. Conclusion

This general equilibrium structure of economy capturing the ecosystem-economy linkage will provide insight into the economic factors which bring about the destruction of the ecological system, and may be used to suggest policy instruments which will curb such tendencies. Policies which may be used after natural disasters to stabilise the economy and promote protection of the forests will also be studied. This structure will be the first step in theoretically studying the role of market forces in the ecological balance and we hope this will open up new horizons for study in the future.

References

Badola R., Barthwal S., and Hussain S. A. (2012). *"Attitudes of Local Communities towards Conservation of Mangrove Forests: A Case Study from the East Coast of India"*, Estuarine, Coastal and Shelf Science 96 (2012), pp 188- 196.

Barbier E. B., and M. Cox (2003). *"Does economic development lead to mangrove loss? A cross country analyses"*, Contemporary Economic Policy,Vol. 21,No.4, pp 418 – 432.

Barbier E. B. (2007). *"Valuing Ecosystem services"*, Economic Policy, pp 177-229.

Das S. (2009a). *"Can Mangrove Minimize Property Loss during Big Storm? An Analysis of House Damage due to the Super Cyclone in Orissa"*, SANDEE Working Paper # 42(09).

Das S. (2009b). *"Addressing Coastal Vulnerability at the Village Level: The Role of Socio-Economic and Physical Factors"*,Working Paper# E/295/2009, Institute of Economic Growth, University of Delhi.

Das S. (2012). *"The Role of Natural Ecosystem and Socio- economic factors in Vulnerability of Coastal Villages to Cyclone and Storm surge"*, Natural Hazards 64, pp 531- 546.

Jones Ronald W. (1965). *"The Structure of Simple General Equilibrium Models"*, The Journal of Political Economy, Vol. 73, No. 6. (Dec.1965), pp. 557 – 572 .

Othman J., Bennett J., and Blamey R. (2004). *"Environmental Values and Resource Management options: A Choice Modelling Experience in Malaysia"*, Development Economics, volume null, Issue- 6, pp 803- 824.

SathirathaiS., and Barbier E.B. (2001). *"Valuing Mangrove Conservation in Thailand"*, Contemporary Economic Policy, Vol. 19, No. 2, pp 109-122.

Social Capital and Fiscal Performance in India

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Introduction

In a democratic setup, generally, citizens delegate the power to their representative agents to conduct social welfare functioning through appropriate fiscal policy. In other words, in a democratic system, citizens (or voters) delegate the power to the elected politicians to form a government and conduct fiscal performance selecting proper public policy. Governments all over the world are concerned with efficiency in public service provision. Here two aspects – (i) the principal–agent relationship[7] between voters (the principals) and politicians (the agents), and (ii) the common pool problem of public finances, are important for the conduct of fiscal policy.

In a democratic system, the role of government is to prepare budget focusing on socio-economic and political issues. Since *budgeting is about resourcing government's strategic objectives and priorities, it has a considerable policy dimension* (especially in resource allocation during budget preparation), but it also has technical or managerial elements (financial management in executing the budget). All governance systems confront the tension between short term political interests, often dictated by electoral cycles, and the longer term need for fiscal stability and service delivery in line with governments' stated policy priorities. The major challenge is to manage the interface between budgeting and politics[8] by designing and implementing institutional and legal frameworks which will improve the quality of political participation and promote fiscal responsibility.

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[7] The principal agent problem refers to a situation in which the principal relies on the agent to perform an action which is in the principal's interest, but that is costly to the agent. If there is information asymmetry and the principal cannot effectively monitor the agent, the agent would have an incentive to behave opportunistically. For instance voters elect politicians to act in their interests, but politicians may instead act in their own personal interests. Similarly civil servants may act in their own interests rather than in that of their political head. The problem of the principle is to design an incentive regime that aligns the interest of the agent with that of the principle, so that the agent – acting in her own interest – will carry out the wishes of the principal.

[8] Imprudent expenditure plans may be adopted in a bid to attract voter support without due consideration of the longer term consequences, or hard decisions which may be politically unpalatable may be postponed.

Recent time, there is growing interest in how political and institutional factors affect fiscal performance at national (Roubini and Sachs 1989, Hagen 1992, Alesina and Perotti 1996, 1997; Poterba 1996, Strauch and Hagen 2000, Perotti and Kontopoulos 2002) and local levels (Dafflon 2002, Hagen and Vabo 2005). Several countries (including India) have accumulated large government debts over last few decades. Government debt is used for development activities in under developed and developing countries.

Currently fiscal deficit rises steeply in India. Several state governments in India have accumulated large fiscal deficits or government debts over 1991-2012. Why do we observe large debts in certain state governments in India? A possible explanation to this question can be found analysing the performance of political institutions in India. These institutions are particularly important for fiscal policy decisions as fiscal institutions create the environment, the incentives, the rules, the regulations and the constraints under which budgets are drafted, approved, and implemented. **Fiscal institutions** promote fiscal discipline through proper design. Sometime an institutional framework (that results in soft budget constraints) provides incentives for loose fiscal discipline. These rules greatly vary over state governments and thus provide a reasonable explanation for cross-section variations in debt levels or fiscal deficit performance levels (Alesina and Perotti, 1995; Poterba and von Hagen, 1999 or Persson and Tabellini 2001).

In this context we should mentioned major difference between quantitative and procedural institutions (Buchanan 1980). Quantitative rules entail tax and expenditures limitation laws, debt brakes and other formal restraints to balance the budget. Empirical observation of Bohn and Inman (1996), Poterba (1997) or Shadbegian (1998) suggest that the budget rules support the fiscal discipline of policy makers. Procedural institutions define how property rights over political decisions are acquired, and assign authority to exercise them. Persson and Tabellini (2003) observed that the constitutional design of the regime type and the electoral rules crucially and significantly shape the fiscal policy decisions.

However, it is impossible to design a constitution to establish a framework of quantitative and procedural institutions that answers all future questions of a society. So, there is certain degree of uncertainty. Hence trust becomes a crucial aspect. Mutual trust in the case of uncertainty reduces transaction costs and makes the institution to work smoothly (Putnam et al 1993, Putnam 2000; Fukuyama 1995). Trust is one of the most important and highly

significant components of a social institution. Here, trust is the social capital of a society and plays the most important role in fiscal policy decisions. So, it is reasonable to assume that social capital fosters fiscal discipline in all society.

Social capital is a broad term containing the social networks and norms that generate shared understandings, trust and reciprocity, which underpin cooperation and collective action for mutual benefits, and creates the base for economic prosperity. Economic development of a nation depends on the impact of social capital which includes social culture, social norms and regulations that promote economic reforms and development activities. Social capital in the sense of trust among members of a civil society and social cohesion fosters the working of government institutions.

This study concentrates on the relationship between fiscal deficit and trust in the government using the sample of major Indian states over the period 1991-2012. We measure trust in two ways (i) as the percentage vote turnover during general election in India, i.e., trust in institution and measuring the level of citizens' chance to express their preferences, (ii) as the percentage of vote share of the winning party with their seat share compare to second largest party. Citizens vote according to their choice as per the political agenda forwarded by political parties. The highest seat sharing party form the government and second largest party becomes opposition or runner. Vote turnovers certainly help to increase governmental responsibility and accountability. It is true that the government is forced to be responsive to citizens' preferences and the underlying social contract rule, which leads to a higher level of fiscal discipline.

Our **hypothesis** states that more trust in government, measured as the electoral support of winner's agenda is a signal for a stronger social cohesion between the government and the electorate, which in turn results in strong fiscal policy decisions.

Literature Review

Social trust is one of the key concepts in the social science. Researchers (Knack and Keefer 1997, Zak and Knack 2001, Beugelsdijk et al 2004 etc.) observe the positive relationship between economic growth and social trust. Interactions among citizens build up social trust. Interaction between trust (thought of as an individual behaviour) and public policy seems to

be important to increase the effectiveness of fiscal performance[9]. In this study we propose one of the fundamental reasons focusing on the country specific quality of informal institutions and more specifically social capital. Social capital refers to the notion of informal institutions which is a proxy of the level of generalized trust.

Concept of social capital and functioning of democracy

The notion of social capital as an important determinant of economic development has gained momentum since 1990s. Coleman (1988) and Putnam et al (1993) introduced and popularised the concept of social capital, and now it is commonly defined as generalized trust (Beugelsdijk and Maseland 2011). Social capital is described as the willingness to trust others without expectation of immediate reciprocity (Whiteley 2000). In a sense, social capital is presented as a form of informal institution, having an impact on the trajectory of the economy. Social capital acts as a complement to the presence of formal institution and as substitute where formal institutions are at an early stage of development. So, a high level of prevailing social capital will discourage politicians to act opportunistically.

Trust is one of the most important dimensions of social capital (Fukuyama 1995, Knack and Zak 2002) and literature proxies the level of social capital using the level of generalized trust (used world value survey data). Putnam et al (1993), Fukuyama 1995, Knak and Keefer 1997, Glaeser et al 2000, Knak and Zak 2002, Beugelsdijk and van Schaik (2005) have examined the relationship between growth and trust suggesting a favourable effect of social capital on economic growth.

In economic literature, the interrelationship between social capital, political regimes and economic performance has not been examined thoroughly.

Boix and Posner (1998) argue that along with between–agent cooperation, social capital enhances the performance of governments and institutions. They argue as high level social capital leads to rational voters who punish underperforming governments. A rational electorate will have preferences that will enforce civic virtue, which is described as a shift from particularized to common interest. Hence, we use the concept of social capital.

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[9] Information asymmetry hampers the proper functioning of markets, and its result is the market failure. 'Benevolent Government' maximise social welfare and it can prevent market failure by providing public goods, for instance. Since information is asymmetry between government and citizens, it is difficult for citizens to evaluate the government's activities. This leads politicians and bureaucrats to behave in a way that maximises self-interest. The government is forced to be efficient to maximise social welfare, resulting in economic growth, if citizens can obtain sufficient information about the government's activities.

There are different interests between low and high social capital agents – (i) low social capital agents have particularised interest leading to short term and personal focus; they will be interested in direct benefits such as public goods that they enjoy, or direct costs like the taxes that they pay, but at the same time they will highly discount generalised costs as amount of debt issued in order to provide the public goods at question. (ii) on the other hand, high social capital agents will equally weight both personal and generalized costs.

Citizens having low social capital will be more prone to accommodate a manipulation in the presence of asymmetric information. Both voters are rational and elect competent political agents. The competence is judged on the basis of the capability which is based on the amount of public goods the policy maker is able to provide but they penalize him for the cost as depicted on the level of taxes and the debt issued. However, low social capital voters highly discount the debt and pay more attention to direct benefits and cost. So, the incumbent will have an incentive to undertake fiscal expansion, either reduce taxes or increase public goods financed by issuing new debt, it actually depends on the ratio of low to high social capital voters in the society.

Social Capital and Trust: Trust has been studies in different disciplines. It is an important concept in social sciences, enforcing the interdisciplinary social discourse among researchers. The work of Putnam (1993) and Fukuyama (1995) have renewed interest on it in the social basis of political and economic development. Putnam (1993) shows the importance of social capital for the effective governance in a democratic social system. According to Putnam (1993) social capital is the features of social organization, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions. Many authors have singled out trust as an important feature of productive social relationships (see, e.g., Gambetta 1988, Hardin 1993, Dinda 2008). Sociologists have also intensively investigated the concept of social capital. Bourdieu (1980) and Coleman (1988, 1990) have strongly influenced the social capital literature focusing on individuals and small societal units. Portes and Mooney (2002) point out that social capital is the ability to secure resources by virtue of membership in social networks or larger social structures. Knack and Keefer (1997) investigated the impact of civic duty and trust on growth and investment rates in a cross section analysis. Knack and Keefer (1997) find a strong and significant positive relationship between social capital variables and economic growth. Looking at the public

finance literature, Slemrod (1998) argues that the social capital derived from the willingness to pay taxes voluntarily lowers the cost of the operating government and of equitably assigning its cost to citizens. The World Bank is also focusing on social capital and investigating the practical relevance of this concept.

There are several views on social capital (Grootaert 2001): First, the concept developed by Putnam (1993) interpreting social capital as a **social network**, as networks of civic engagement facilitating *coordination and cooperation*. Second, Coleman's (1988) approach defines social capital as "a variety of different entities", consisting of some aspects of **social structure** and facilitating certain *actions of actors*. This allows taking into account not only horizontal but also vertical social relationships. Third concept considers the social and political environment that enforces *norms* and **shapes social structures**.

Our investigation in this paper grounds basically on the third concept, which takes the more formalized institutional relationship between state and citizens at the vertical level into account. As trust is a multidimensional concept, we restrict our focus on a specific dimension: citizens' political trust. This is in line with Rothstein (2003), who argues that the explanation of social capital is much more grounded in political instead of sociological variables.

Government accountability can be seen as the most important aspect of trust with respect to fiscal performance. Engagement, involvement and participation in political and public issues by a large part of the electorate are an important feature to hold politicians and bureaucrats accountable. As the government is better aware of citizens' preferences, policies will better reflect citizens' needs (see Boix and Posner 1998). It is reasonable to argue that a certain level of fiscal discipline can be seen as a proxy for governmental performance. Voter turnover rates help to increase governmental accountability, so that the government is forced to be responsive to citizens' preferences and the underlying social contract rule of law at large, favouring a higher level of fiscal discipline.

Social capital is a new field, suffering from a great lack of good, reliable data. Both time series and cross-country evidence are missing. Social capital is a promising concept, which can be operationalized by relatively simple measurement. Vote turnover percent in the election in the democracy is taken to measure trust on institution. To measure mutual trust among citizen, their representatives and political institutions we also use the information

from winning vote percentage share and runner up vote share. Our basic assumption is that electoral support to the agenda of winning political party, government proposals, reveals social trust on government (formed by winning party, or its associates). Electoral support of government proposals reveals an important aspect of trust. Fiscal performance is measured in terms of tax and nontax revenue, expenditure, and/or fiscal deficit (expenditure – revenue).

This paper investigates the relationship between social capital (social trust) and fiscal performances using state level data in India.

Methodology and Data

This study focuses on fiscal performance, which is measured in terms of revenue and expenditure and/or, surplus or deficit. As per RBI there are several definitions of deficits. Following RBI deficits are measured as given below:

a) Revenue Deficit (RD) denotes the difference between revenue receipts and revenue expenditure.

   Revenue Account Gap = Revenue Deficit (RD) = Revenue Receipts (RR) – Revenue Expenditure (RE).

b) Capital Deficit denotes the difference between capital receipts and capital disbursements.

   Capital Account Gap = Capital Account Deficit (CAD) = Capital Receipts (CR) – Capital Disbursements (CD).

c) Conventional deficit (budgetary deficit or overall deficit) is the difference between all receipts and expenditure, both revenue and capital.

   Overall Gap = RD + CAD = (RR – RE) + (CR – CD) = [(RR + CR) – (RE + CD)].

d) Gross Fiscal Deficit (GFD) is the difference between aggregate disbursements net of debt repayments and recovery of loans and revenue receipts and non-debt capital receipts.

   Gross Fiscal Deficit (GFD)

   = RE + [CD – (Discharge of Internal Debt. (DID) + Repayment of Loans to Centre (RLC) + Recoveries of Loans & Advances (RLA)] – RR

   = RE + [Capital Outlay (CO) + Loans & Advances by States (LAS) + DID + RLC – (DID + RLC + RLA)] – RR

= (RE – RR) + [CO + (LAS – RLA) + (DID – DID) + (RLC – RLC)]

= RD + CO + Net Lending (NL).

e) Net Fiscal Deficit (NFD) is the gross fiscal deficit less net lending of the State Governments.

Net Fiscal Deficit (NFD) = GFD – (LAS – RLA).

f) Gross Primary Deficit (GPD) is defined as GFD minus interest payments.

Primary Deficit (PD) = GFD – Interest Payment (IP).

g) Net Primary Deficit (NPD) denotes Net Fiscal Deficit (NFD) minus net interest payments.

Net Primary Deficit (NPD) = NFD – [(IP – Interest Receipts (IR)].

h) Primary revenue balance denotes revenue deficit minus interest payments.

Primary Revenue Balance (PRB) = RD – IP.

i) Net Primary Revenue Balance denotes revenue deficit minus net interest payments.

Net Primary Revenue Balance (NPRB) = RD – (IP – IR).

Measuring Social Capital

Basically, two approaches can be discerned in the conceptualization of social capital as a characteristic of communities. In the first, social capital is defined using aggregate-level data on, say, the density of voluntary organizations or rates of political participation. The second strategy relies on aggregated individual-level survey data. As data availability precludes the inclusion of survey-based indices at local level (Municipality and Panchayat), we follow the former approach in our analysis and use only macro-indicators for the measurement of social capital. Specifically, three different indicators are used.

Our first indicator of social capital measures **associational life**. We include this variable, as a wide interlocking web of formal organizations refers to a high level of social capital. Voluntary associations are seen as creators of social capital because of their socialization effects on democratic and cooperative values and norms. Moreover, the trust and norms of reciprocity that people generate in associations are spread over the whole community, encompassing citizens who are not equally active in associational life (Stolle, 2000). We use a wide variety of organizations (per capita) in each state to measure the density of associational activity. In this study we use **average household size** in each state. Household

size is an indicator of basic minimum socio-economic associational life. Household is the basic social unit for economic and political activity.

In a democratic system, household members (citizens or voters) delegate the power to the elected politicians to form a government and conduct fiscal performance selecting proper public policy. Representative delegates form the government and take decision related to public policy. Hence, vote turnover is an important variable for us. In correspondence with Casey (2004), Costa and Kahn (2003), Putnam (2000), and Serra (1999), we use **electoral turnout** in the general elections as a second indicator of social capital. This is measured as the number of votes cast on Election Day (valid as well as invalid) divided by the number of registered voters. It refers to civic involvement and participation in public affairs. Turnout rates ranged from 23.5% to 92.8% in the election under study and thus show significant variation between the states. This significant variation in actual turnout rates allow us to interpret high turnout levels as signalling an engagement toward the ''common good'' and thus a high level of social capital (see also Overbye, 1995). The extent of associational life and electoral turnout are indicators that cover the **structural component of social capital.**

Fukuyama (1995), Inglehart (1997), and Putnam (1993) have suggested that social norms, but in particular trust among citizens, establish the cultural aspects of social capital. Education level is a good indicator of cultural dimension of general social capital, hence, we may consider average **literacy rate** as indicator of social capital. Literacy rate generates social trust and development. There is also an antitrust, negative side of the society. As Delhey and Newton (2004) have shown that distrust accompanies conflict, **the crime rate** can be conceived as an indicator for the level of generalized trust within a state and thus as an objective proxy for the attitudinal (or cultural) component of social capital. Hence, and thereby following Rice and Sumberg (1997), the crime rate per capita in each state is used as our third indicator of social capital. Clearly, as crime in societies will lower citizens' respect and trust in one another, low crime rates are expected to be indicative of a high level of social capital.

The above three indicators are expected to be measuring a similar underlying concept of social capital. Hence, we combine them into a single index through a factor analysis using **Principal Component Analysis** (PCA) as the method of extraction. This mitigates the influence of idiosyncratic measurement error within each of the variables and maximizes the

likelihood of measuring the underlying concept more precisely. Thus, even though the individual indicators of social capital are arguably less than ideal and their choice might be criticized, the component retrieved from the PCA analysis ''probably measures social capital better than any single indicator'' (Bjørnskov, 2003; see also Knack, 2002; Rice & Sumberg, 1997).

The results of the PCA are summarized in Table 1. It is clear from Table 1 that the absolute value of the component loadings of all three indicators is above the critical value of 0.35 (Pennings, Keman, & Kleinnijenhuis, 1999). Hence, each of the elements loads powerfully onto one underlying component extracted from the data. Note also that with the use of all three indicators into one principal component, our index of social capital comprises both structural aspects (i.e., associational life including political involvement) and a cultural aspect (i.e., the crime rate as a proxy for social trust). Hence, our social capital index takes account of the dual nature of the concept.

Observations

Trusts on Institutions

Voters cast their votes to elect and send their representatives to the policy making institution. Here, voters reveal their trust on (i) institution and (ii) representatives. So, participation of voters in the election process is actually trust on the policy making institutions. Trust on institution is measured here as voter turnover rate (percentage). There are two types of policy-making institutions in national and state levels. Voter turnover in the parliamentary and assembly elections are the indicators of trust on national and state policy-making institutes, respectively. Here we first discuss trust on national policy-making institution, secondly on state or provincial policy- making institution, and finally, on local policy-making institutions.

Trust on National policy-making Institution

Table 1 shows the trend of voter turnover rate in several general elections over the period of 1951-2014. Basically, Table 1 and Fig 1 display the trend of overall trust on policy making institution in India since 1951. Trust on institution in India is more or less fixed over long run with short run fluctuation (Fig 1). Overall national trust on institution can be decomposed into state levels. Trust on institution in the state levels are the voter turnover rates in a general election. Table 2 demonstrates the state-wise trend of voter turnover rates during 1989-2014.

It is clear that there is huge variation among states in the post liberalization period in India. So, State-wise trust on central policy making institution varies due to several socio-economic and political reasons.

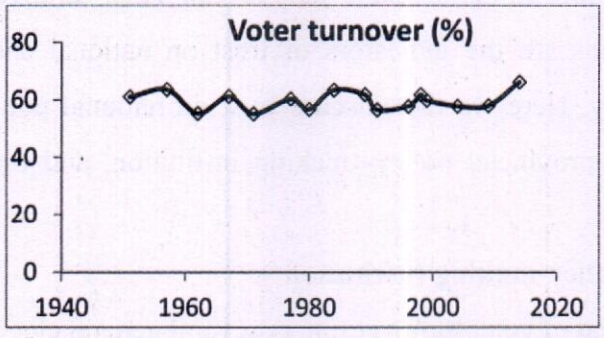
Table 1: Trend of voter turnover during 1951- 2014

Election Year	Registered Voters (Million)	Voter turnover (%)
1951	173.2	61.16
1957	193.7	63.73
1962	216.4	55.42
1967	249.0	61.33
1971	274.2	55.29
1977	321.2	60.49
1980	356.2	56.92
1984	379.5	63.56
1985*	20.8	72.23
1989	498.9	61.95
1991	498.4	56.73
1992#	13.2	23.96
1996	592.6	57.94
1998	605.9	61.97
1999	619.5	59.99
2004	671.5	57.98
2009	717.0	58.19
2014	834.1	66.4

Note: *Elections were held separately for States of Assam & Punjab. #Elections were held separately for Punjab.

Source: ECI publications & website: www.eci.nic.in

Fig 3.1: Voter turnout (%) in the period of 1951 -2014



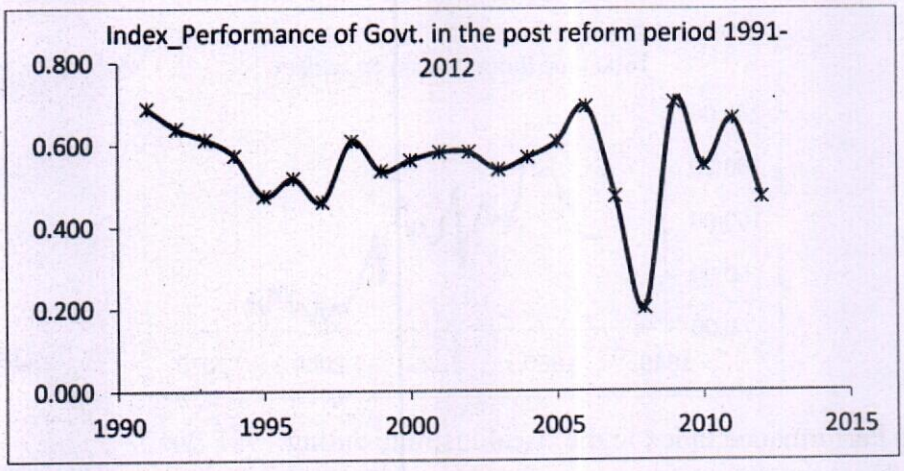
Data Source: ECI publications & website: www.eci.nic.in

Performance of the Institution

Here, we use an index measuring the performance of the fiscal institution. Institution performance index is calculated as the ratio of actual government business days performed out of total session days in the year. Initially institution performance index slowly declines

till mid 1990s and fluctuates in late 1990s but rises slowly during 2000-2006, then a sudden huge fall in 2008 which was the lowest performance of the fiscal institution since 1991 (see, Fig 2). Overall in the post reform period the performance of institution in terms of business days declines with fluctuation over time. Truly the performance of the institution is fully depends on performance of the government, which depends on the composition of political entities with their political agenda that is directly linked with representatives. Hence, we have to examine the performance of our representatives in the fiscal institution.

Fig 2: Performance of the fiscal institution during the period of 1991-2012.



Trusts on Representatives and their Performance

Performance of the representatives (MPs or policy makers) in the fiscal institution especially fiscal policy discussion during budget session in the Parliament of India is simply measured in terms of effort hours on budget discussion. Performance of representative is measured in terms of (a) demand for grants and (b) total time taken on budget discussion. Budget session is crucial for making fiscal policy in right direct in a democratic set up. Fig 3 shows that discussion on demand for grants has a sharp fall since 1990s. Total time taken is also drastically falls since 1990s. This indicates that fiscal institution in India becomes weak. Group of politicians are much more interest about their local or regional issues than national issues even they are not interested to formulate regional development policy through discussion in the Parliament of India. In other way, we can argue that our representatives are not performing their duty properly for making public policy in the parliament effectively.

Fig 3: Performance of the representatives during the period of 1951-2012.

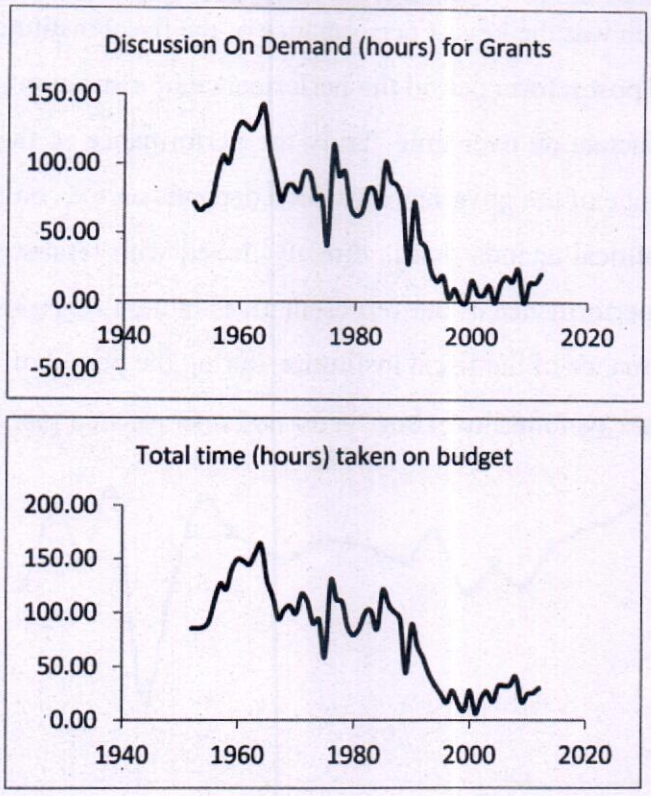


Fig 4: MP's Performance Index in the fiscal institute during 1951-2012.

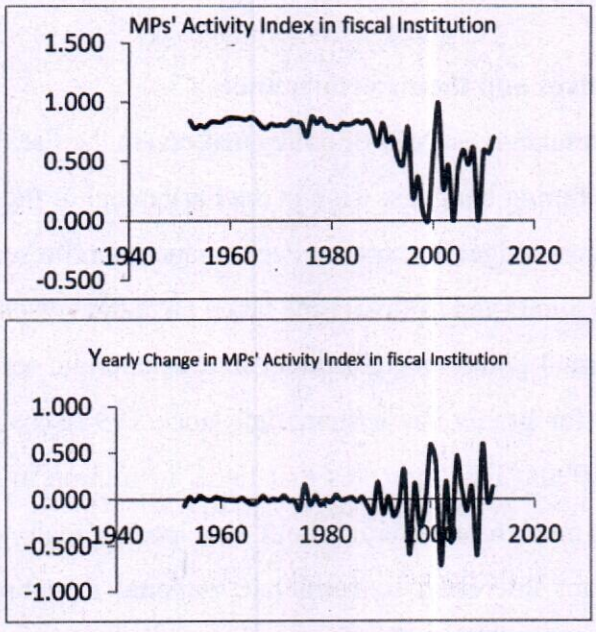


Fig 4 shows the trends of MP's activity index since 1951. MP's activity index is measured as the ratio of active participation to total budget discussion during budget sessions only. To capture the behaviour of MP's activity related to fiscal policy formation we also study annual

change of the MP's activity index. Bottom part of the fig 4 shows the huge fluctuation of MP's activity index since 1990s. There is high volatility in the performance indices of MP's activity and also fiscal institution. Perhaps, Indian socio-economic system may be confused, and social trust on central institution is also volatile, which is reflected in general election for lok sabha.

Fiscal Performance

Fig 5: Debt (% of GDP) of Centre and State Govts during 1980-81 – 2012-13.

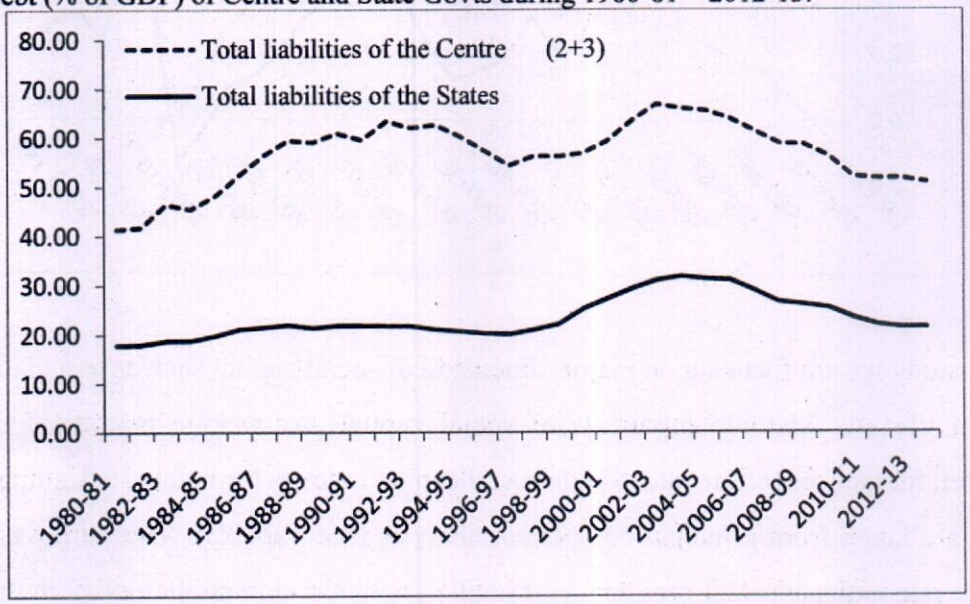


Fig 6: Domestic and External debts of Central Govt during 1980-81 – 2014-15

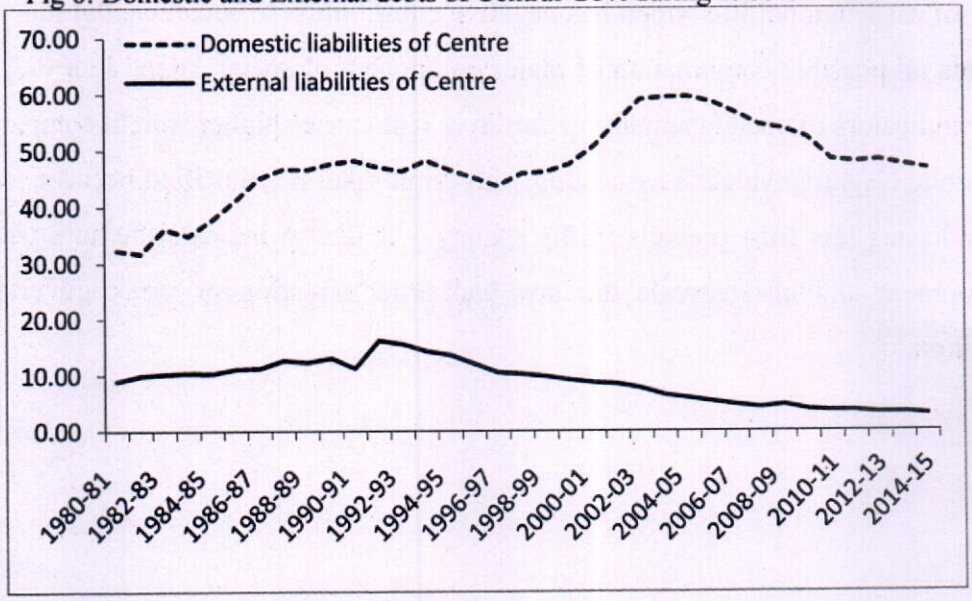
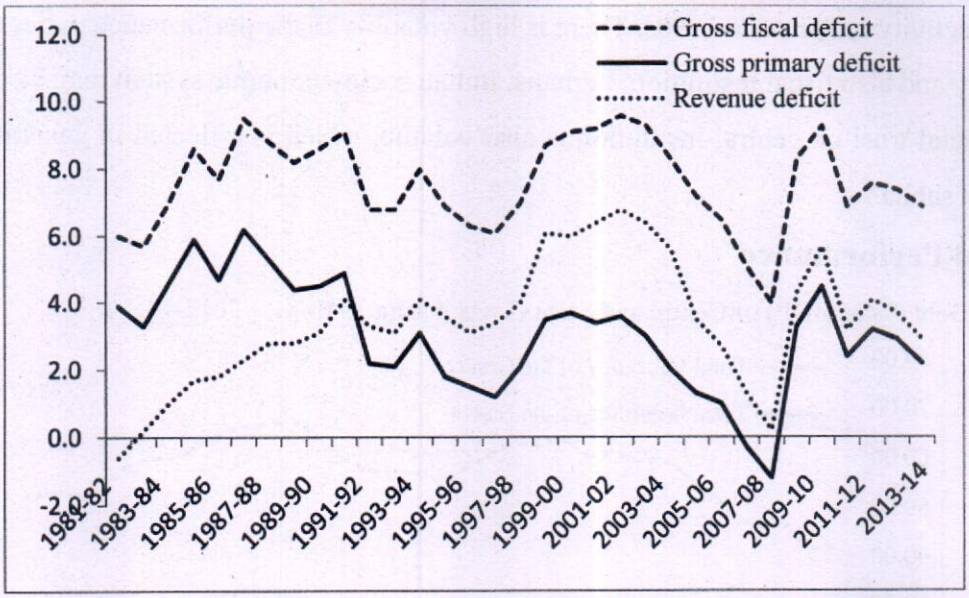


Fig 7: Combined Deficit (% of GDP) of Centre and State Governments since 1980-81.



In this study we are focusing on major dimension of social capital such as associational life, cultural life etc. Major components of social capital are average household size, vote turnover, literacy and crime rate. Single social capital index is formulated assigning weights, which are taken from principal component analysis (see Table 2). Vote turnover rate and literacy rate indicate social preference of public goods through public policy in discussion. Family size and crime rate assign negative value to social capital index. Family size is the proxy of associational life which has negative contribution to social capital index. Table 2 presents all possible combination of major component of social capital index. Among our major indicators of social capital vote turnover rate carries higher weight compare to other indicators. Negative value is associated with crime rate. It is justified because more crime rate indicates less trust prevails in the society – it is also indicate the antitrust to social development and also reveals the law and order situation or weak government and institution.

Table 2: Social Capital Component

A:

Component Measure	Component Loading
Vote turnover	0.5729
Econ Crime rate	-0.1601
Avg (min)Association size	-0.583
Literacy rate	0.5534
Eigenvalue	1.76948
Percentage variation	44.24

Note: SC index is generated using above weights. Using this component loading we have calculated social capital index (scindex).

B:

Component Measure	Component Loading
Vote turnover (LS)	0.6113
Vote turnover (BS)	0.6032
Econ Crime rate	-0.2701
A.F. Size [Association size]	-0.4352
Eigenvalue	2.1063
Percentage variation	52.66

Note: SC is genera ed using above weights.

C:

Component Measure	Component Loading
Vote turnover (LS)	0.6754
Vote turnover (BS)	0.6219
Econ Crime rate	-0.3040
Eigenvalue	1.8478
Percentage variation	61.59

Note: SCC is generated using above weights.

Table 3 describes the impact of the major components of social capita on revenue generation which is a vital component of fiscal performance. Revenue source is mainly own tax and own nontax. Vote turnover rate is highly significant but its impact on revenue collection is different and in opposite direction, i.e., own tax revenue falls as vote turnover increases while own nontax revenue rises. It indicates that higher social (trust) capital reduces own tax (or direct tax) revenue. More associational life reduces tax revenues whereas literacy rate has positive impact on it. Crime rate has also positive impact on it. This suggests that as crime rate increases social general trust is reduced thereby social capital declines which forced to increase both tax and nontax revenues.

Table 3: Major dimensions of social capital and revenue performance

Variables	OTRGSDP	ONTRGSDP
Vote turn over	**-0.099*** (-9.65)**	**0.1028*** (3.07)**
Eco Crime rate	0.08496** (2.35)	0.171* (1.72)
Literacy rate	0.0433*** (3.03)	-0.066*** (-2.9)
Pop density	-0.00004 (-0.79)	-0.00031*** (-3.47)
A. F. Size	-1.2395*** (13.23)	0.31316 (0.75)
Seat margin	-0.0005 (-0.16)	-0.01229*** (-4.89)
Constant	15.56*** (11.26)	-0.902 (-0.2)
R^2	0.2252	0.0488
N	180	180

Note: Numbers in parentheses are t-values. '***', '**' and '*' denote the level of significance at 1%, 5% and 10%, respectively.

Table 4 provides the results of social capital index and revenue performance. Combining major social dimensions all types of social capital index has indirect effect on tax revenue but direct effect on nontax revenue in India. Here higher value of social index indicates higher level of social trust as proxy of higher social capital. So, more social capital suggests less direct tax burden however more nontax revenues.

Table 4: Social Capital Index and Revenue performance

A		
	OTRGSDP	ONTRGSDP
Scindex	**-0.04497*** (-4.64)**	**0.0479* (1.68)**
Pop density	0.00015*** (6.07)	-0.000298*** (-6.4)
Seat margin	-0.00006 (-0.02)	-0.0148*** (-9.21)
Constant	9.67*** (11.6)	0.306 (0.16)
R^2	0.056	0.0281
B		
	OTRGSDP	ONTRGSDP
SC	**-0.0400218*** (-3.52)**	**0.03626* (1.74)**
Seat margin	0.0001317 (0.03)	-0.000347 (-0.03)
Literacy rate	-0.030976 (-1.23)	-0.10656 (-1.34)
Lnpcsgdp	1.4182*** (3.63)	3.133** (2.53)
Lnpopdensity	0.6253*** (4.44)	-1.704*** (-3.81)
Constant	-6.846** (-2.04)	-16.64 (-1.56)
R^2	0.3209	0.1362
Adj R^2	0.3007	0.1105
N	174	174
C		
	OTRGSDP	ONTRGSDP
SCC	**-0.037174*** (-3.6)**	**0.5691* (1.74)**

Note: Numbers in parentheses are t-values. '***', '**' and '*' denote the level of significance at 1%, 5% and 10%, respectively.

Table 5 presents the estimated results of selected few fiscal indicators as percentage of gross state domestic product. Major fiscal variables are own tax revenue (OTR), own nontax revenue (ONTR), interest payment (IP), Non development revenue (NDR), etc. Vote margin has direct impact on all the variables except own tax revenue (OTR). So, politically social trust improves nontax and non development revenues. Result of interest payment is also increases with vote margin which is unexpected. Income level is also important for all the fiscal variables. More results are needed to discuss in details.

Table 5: OLS estimated results of selected few fiscal indicators measured in % of gsdp

Variables	OTR	ONTR	IP	PN	CT	NDR
Vote margin	-0.062*** (-4.89)	0.3162*** (9.58)	0.0208*** (3.31)	0.0124** (2.12)	0.525*** (5.5)	0.3607*** (9.28)
Eco Crime rate	0.0738* (1.74)	0.312*** (2.82)	0.0274 (1.3)	-0.038* (-191)	-0.21703 (-0.68)	0.2107 (1.62)
Literacy rate	-0.092*** (-3.86)	-0.039 (-0.63)	0.0592*** (5.02)	0.073*** (6.64)	0.6474*** (3.61)	0.3282*** (4.5)
Pop density	-0.00009 (-0.93)	-0.0007*** (-2.8)	-0.0001*** (-2.77)	-0.0001** (-2.21)	-0.00078 (-1.08)	-0.0008*** (-2.72)
Avg Family Size	-1.358*** (-4.38)	.6637 (0.82)	0.82735*** (5.39)	0.514*** (3.59)	8.3186*** (3.56)	4.078*** (4.29)
pcsgdp	0.00005*** (5.41)	0.00003 (1.23)	-0.00002*** (-4.99)	-.0003*** (-6.06)	-0.00032*** (-4.66)	-0.00012*** (-4.14)
Constant	17.981*** (6.85)	-2.544 (-0.37)	-5.302*** (-4.08)	-4.72*** (-3.89)	-63.105*** (-3.2)	-35.185*** (-4.38)
R^2	0.2759	0.3700	0.2828	0.3427	0.2813	0.4138
Adj.R^2	0.2508	0.3481	0.2579	0.3198	0.2564	0.3935
N	180	180	180	179	180	180

Note: Numbers in parentheses are t-values. '***', '**' and '*' denote the level of significance at 1%, 5% and 10%, respectively.

Conclusion

More social capital reduces direct tax revenues; however, it helps to increase nontax revenues. Higher social capital also reduces the fiscal deficits which are highly desirable.

References

1. Alesina, A. and R. Perotti (1995), The Political Economy of Budget Deficits, *IMF Staff Papers* 42, 1-31.
2. Coleman, J. S. (1988). Social Capital in the Creation of Human Capital, *American Journal of Sociology*. 94: 95-121.
3. Colemen, J. S. (1990). *Foundations of Social Theory*. Cambridge, Mass: Belknap Press of Harvard University Press.
4. Dinda, S., (2008), Social Capital in the creation of Human Capital and Economic Growth: A Productive Consumption Approach, *Journal of Socio-Economics 37(5), 2008, 2020-2033.*
5. Fukuyama, F. (1995), Social Capital and the Global Economy, *Foreign Affairs* 74, 89-103.
6. Knack, S. (1999), Social Capital and the Quality of Government: Evidence from the U.S. States, World Bank Policy Research Working Paper Series: 2504

7. Knack, S. and P. Keefer (1997). Does Social Capital Have an Economic Payoff? A Cross-Country Investigation, *Quarterly Journal of Economics.* 4: 1251-1288.
8. La Porta, R.; F. Lopez-de-Silanes, A. Shleifer and R.W. Vishny (1997), Trust in Large Organizations, *American Economic Review* 87, 333-338.
9. Poterba, J. M. and J. von Hagen (1999), Fiscal Institutions and Fiscal Performance, NBER, University of Chicago Presss, Chicago.
10. Putnam, R. (2000), Bowling Alone: Collapse and Revival of American Community. New York, Simon and Schuster.
11. Putnam, R. D. (1993). Making Democracy Work. Civic Traditions in Modern Italy. Princeton: Princeton University Press.

Assessing Fiscal Performance of Indian States: A Composite Fiscal Index

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Abstract

This paper looks at the relative fiscal performance of Indian states over a span of ten years starting with 2002-03 and ending in 2011-12. Having combined the individual indicators of revenue effort, expenditure management and indebtedness of each state, the paper develops a composite index of fiscal performance, namely, Fiscal Performance Index for each and every general category states and compares their relative performances over time.

Key Words: Revenue, Debt, Fiscal Performance, India

JEL Classification: H10, H11, H20

1. Introduction

Fiscal performance of a government is normally assessed against a benchmark or valid reference point. In Indian federal system fiscal performance of an individual state is judged in terms of different fiscal parameters taking national average (all state average or in some cases general category states' average) as the valid reference point. Individual indicators of revenue effort, expenditure management and debt liability of a state are normally used to evaluate the fiscal health of a state. But to assess the overall picture we need to develop an index which captures all the relevant aspects of state finance and can be used readily to judge the overall fiscal performance of a state. This paper develops a composite index of fiscal

performance for each general category states[10] (GCS) by combining individual indicators of revenue effort, expenditure management and indebtedness in terms of their relative performance. The composite index is named as Fiscal Performance Index (FPI)[11]. The purpose of the Index is to provideinformation about how the sates are performing when compared against other states. Based on the index value we can rank different states and see how their relative rankings are changing over the years.

2. Methodology

In the construction of a composite index there are two key issues involved. Firstly, we will have to identify which are the key indicators which will be considered in the construction of the composite index; and secondly, how these individual indicators should be weighted to construct a composite index of fiscal performance. The index proposed in this paper considers six individual indices to capture various aspects of fiscal performance. The individual indices are: Own Tax Earning Performance Index, Own Tax Spending Performance Index, Development Expenditure Performance Index, Commitment Capacity Performance Index, Committed Expenditure Performance Index, and Debt Performance Index. We have not considered any deficit related indicators directly because they are essentially the outcome of revenue performance and quality of expenditure management by a state. We have taken our individual indicators from the revenue and expenditure side in such a way that they capture the quality of revenue performance and expenditure management.

It is important to note that out of the six individual indicators, three are with positive characteristic and the rest three have negative features. Any indicator is meant to be positive when increasing value represents better performance and negative if it happens to be the opposite. Accordingly, the three positive indices are namely Own Tax Earning Performance Index, Own Tax Spending Performance Index and Development Expenditure Performance

[10]We have not considered the special category states as these states are heavily dependent on central transfers and so their fiscal performances are not comparable with general category states. One can easily use this methodology to assess the fiscal performance of special category states separately.

[11] Some researchers have already tried to construct an overall fiscal performance index using different fiscal indicators. Dholakia (2005) has considered eight individual indicators to construct a combined index of fiscal performance for Indian states. Many indicators, considered by the paper are highly correlated and therefore can be dropped. However, Dholakia (2005) focused on fiscal discipline as she proposed it as an index that can be used in central transfer formula. In our case we are more interested in assessing fiscal performance and relative rankings. The methodology used in this paper is also different from that used in Dholakia (2005).

Index. The rest three indices are negative. Irrespective of the dimension of the individual indices, we intend to develop the composite index as positively directed with higher value representative of better performance and vice versa. To do this, all negative individual indices are to be converted into positive value by taking inverse of the indicator variable by which the individual index is composed of. These indicator variables for each and every index are summarized in Table: 1.

Table-1

Individual Indices and the Indicator Variables

	Indices	Indicator Variable Used
1	**Own Tax Earning Performance Index**	$\frac{\text{Own Tax Revenue}}{\text{GSDP}}$
2	**Own Tax Spending Performance Index**	$\frac{\text{Own Tax Revenue}}{\text{Total Revenue Expenditure}}$
3	**Development Expenditure Performance Index**	$\frac{\text{Development Expenditure}}{\text{Non Development Expenditure}}$
4	**Commitment Capacity Performance Index**	$1-\frac{\text{Committed Expenditure}}{\text{Total Revenue Receipt}}$
5	**Committed Expenditure Performance Index**	$1-\frac{\text{Committed Expenditure}}{\text{Total Revenue Expenditure}}$
6	**Debt Performance Index**	$1-\frac{\text{Debt}}{\text{GSDP}}$

Before using the individual indicators in the composite index we need to normalize them so that none of the indicators gets a disproportionate weight in the overall index. Each individual indicator was normalized between 0 and 1 in such a way that a movement towards 1 indicates improvement in fiscal performance. The paper uses the following normalization method[12].

[12]This methodology has been used widely by many researchers. For more on methodological issues one can go through HDR (1993) and Mazumdar (2003). For more recent application of this methodology in index construction one can go through RaghuramRajan Committee Report (2013).

$$FPI_i = \frac{x_{ijt} - min(x_{it})}{max(x_{it}) - min(x_{it})}$$

*i*stands for individual indices, *j* stands for state and *t* stands for time point.

x_{ijt} = Value of i^{th} indicator variable for j^{th} state at time point t.

$min(x_{it})$ = Minimum value of i^{th} indicator across all states at time t.

$max(x_{it})$ = Maximum value of i^{th} indicator across all states at time t.

We are using a method which is normally termed as "Moving Goal Post Method" where the maximum and minimum values for each of the indicators are taken from the actual data set for each year. Some researchers argue that a "Moving Goal Post Method" can make absolute index values non-comparable over time. For example, a state might have improved its performance in an individual index but its index values can actually fall because the top or the bottom states have done even better. They advocate in favourof a"Fixed Goal Post Method" where the maximum and the minimum values are arbitrarily fixed. Problem with this "Fixed Goal Post Method" is that it does not take care of a time trend of an individual indicator that might have been there. As we are interested in the relative rankings based on the index value rather than the absolute index value itself, we are using the "Moving Goal Post Method" as it can capture the relative performance in a better way. For example if there is any positive time trend, say,Min is increasing, then a fixed Min will not capture the true relative position. Individual indices also can be used to judge how the states are doing in terms of different aspects of fiscal finance. Finally, the simple arithmetic mean of these six indices would give us the composite index of fiscal performance, i.e. Fiscal Performance Index.

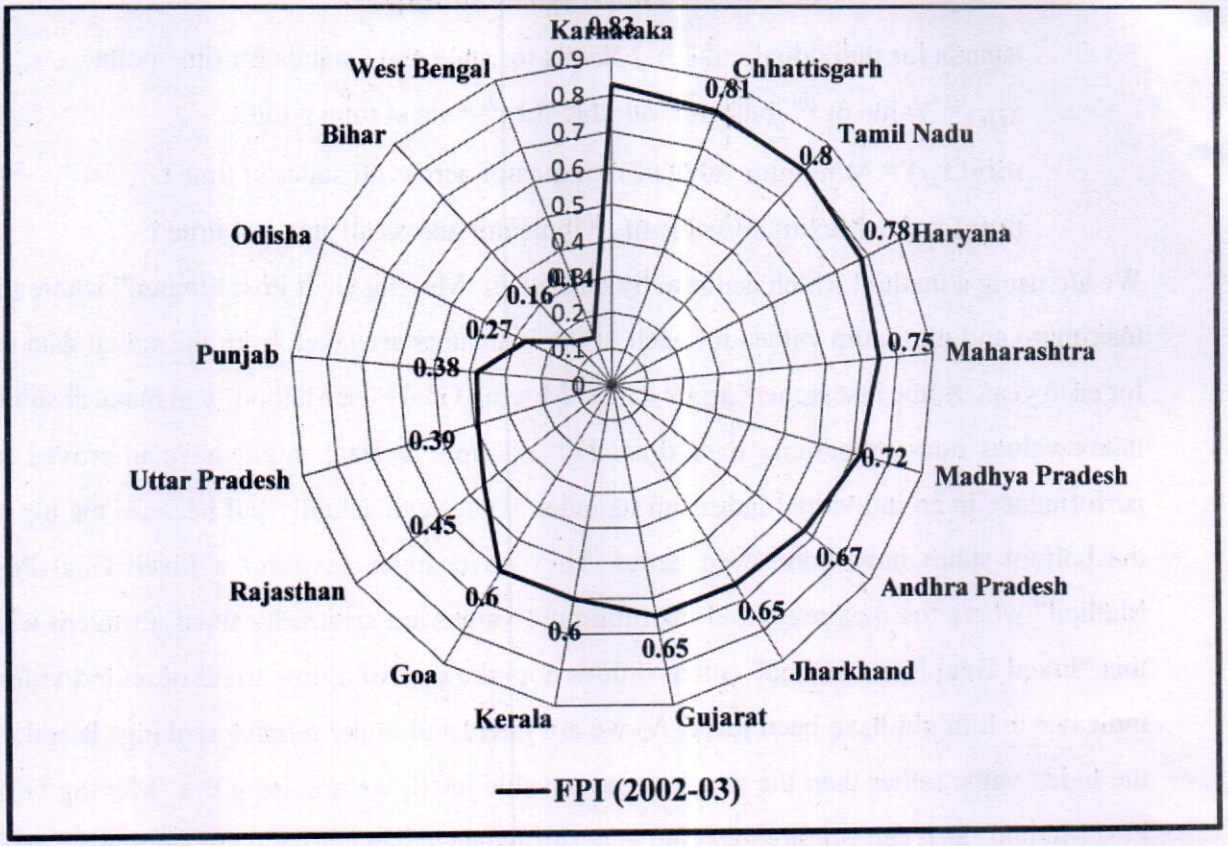
3. Results& Discussion

For the purpose of our study, we have considered 17 general category states. So, our j = 1, 2, 3, ……, 17 and the period of our study is from 2002-03 to 2011-12. So, our t = 2002-03, 2003-04, ……., 2011-12. Accordingly, we would get values of all indices along with the composite FPI for all states for each year starting from 2002-03 and ending in 2011-12. Overall Fiscal Performance Index for all general category states for 2002-03 and 2011-12 are presented in Figure: 1& 2[13].

[13] Fiscal Performance Index (with rankings) and all the sub-indices for all years and all states are available in Appendix Tables.

Figure-1

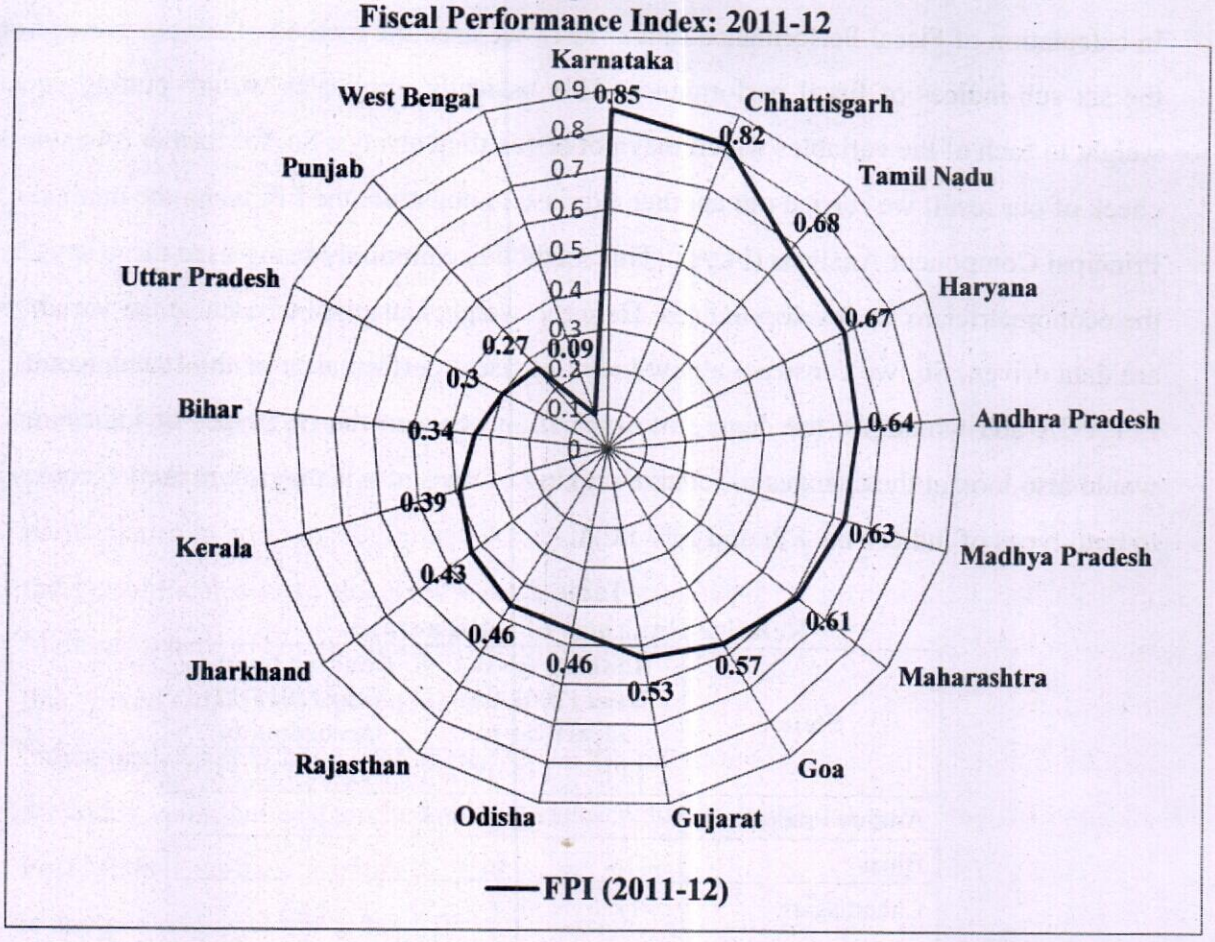
Fiscal Performance Index: 2002-03



Source: Authors' own calculation.

Figure-2

Fiscal Performance Index: 2011-12



Source: Authors' own calculation

In our FPI radar distance from the centre measures the fiscal performance of a state – more the distance better the performance. As can be seen from Figure 1 and 2, West Bengal remained around the centre indicating worst fiscal performance. Moreover, in terms of absolute index value also its relative performance deteriorated. Karnataka, on the other hand, remained at the top for the entire period. Relative rankings of all general category states are summarized in table 2. As can be seen from Table 2, West Bengal remained at the bottom (17^{th} rank) for the entire period. States like Odisha, Madhya Pradesh, Bihar, Tamil Nadu and Andhra Pradesh improved their relative rankings whereas relative performance of Goa, Punjab and Kerala deteriorated. Though some of the states have altered their relative positions, West Bengal's poor fiscal performance continued throughout the entire period. A detailed analysis suggests that West Bengal performed badly in almost all individual sub-indicators.

4. Robustness Checks

In calculation of Fiscal Performance Index (FPI), we used the method of simple average of the six sub-indices of fiscal performance. This basically implicates we are putting equal weight to each of the variables which may not be justified always. So, for further robustness check of our result we carried out another exercise to construct the FPI using the method of Principal Component Analysis (PCA). This method is commonly being used these days by the econometricians to develop indices. Here the weights attached to each of the variables are data driven. So, we construct a new index of fiscal performance of the states, namely, FPI_PCA and would see the degree of association between the two types of indices and would also look at the changes in relative ranking of the states if they are ranked according to both types of indices i.e. FPI and FPI_PCA.

Table-2

Relative Rankings of Indian states

State	Ranking for the Year (2002-03) according to		Ranking for the Year (2011-12) according to	
	FPI	FPI_PCA	FPI	FPI_PCA
Andhra Pradesh	7	8	5	6
Bihar	16	16	14	13
Chhattisgarh	2	1	2	1
Goa	11	10	8	7
Gujarat	9	9	9	9
Haryana	4	4	4	3
Jharkhand	8	7	12	12
Karnataka	1	2	1	2
Kerala	10	11	13	14
Maharashtra	5	5	7	8
Madhya Pradesh	6	6	6	5
Odisha	15	15	10	10
Punjab	14	14	16	16
Rajasthan	12	12	11	11
Tamil Nadu	3	3	3	4
Uttar Pradesh	13	13	15	15
West Bengal	17	17	17	17

Source: Authors' own calculation.

Table-2 presents the relative ranking of states based on alternative approaches. It is quite clear that the ranking doesn't vary much if the composite index is developed using Principal Component Analysis. We also had gone for testing the correlation between the two types of indices so as to understand the degree of association between the two. The correlation coefficient between FPI and FPI_PCA (index value) is 0.99953 (significant at 1 per cent) for 2002-03, while the same for 2010-11 it is 0.9918 (significant at 1 per cent). The Pearson's Rank Correlation coefficient value for both the years is nearly 0.98 and are highly significant. This substantially validates our earlier result.

5. Concluding Remarks

Combining the individual indicators of revenue effort, expenditure management and indebtedness of each state, the paper develops a composite index of fiscal performance for each and every general category states and compares their relative performances over time. Relative rankings based on this composite index reveal that states like Odisha, Madhya Pradesh, Bihar, Tamil Nadu and Andhra Pradesh improved their fiscal performance over the years whereas relative performance of Goa, Punjab and Kerala deteriorated. West Bengal is the worst performer and remained at the bottom for the entire period.

References

Dholakia, A. (2005). Measuring Fiscal Performance of States: An Alternative Approach. *Economic and Political Weekly, 40*(1), 3421-3428.

Mazumdar, K. (2003). A New Approach to Human Development Index. *Review of Social Economy, 61*(4).

Raghuram Rajan Committee. (2013). *Report of the committee for evolving a composite development index of states.* Ministry of Finance, Government of India.

United Nations Development Programme. (1993). *Human Development Report.* Oxford University Press.

Appendix

Appendix Table: 1

Indicators of Fiscal Performance for the Year 2011-12

Year	State	Own Tax Earning Performance Index	Own Tax Spending Performance Index	Development Expenditure Performance Index	Commitment Capacity Performance Index	Committed Expenditure Performance Index	Debt Performance Index	Fiscal Performance Index
2011-12	Karnataka	1.00 (1)	0.99(2)	0.73(2)	0.87(3)	0.83(2)	0.66(5)	0.85(1)
2011-12	Chhattisgarh	0.55(7)	0.38(11)	1.00(1)	1.00(1)	1.00(1)	1.00(1)	0.82(2)
2011-12	Tamil Nadu	0.91(2)	1.00(1)	0.32(13)	0.62(10)	0.51(9)	0.75(3)	0.68(3)
2011-12	Haryana	0.42(11)	0.74(6)	0.64(4)	0.65(8)	0.66(5)	0.88(2)	0.67(4)
2011-12	Andhra Pradesh	0.67(5)	0.68(8)	0.57(5)	0.68(6)	0.60(6)	0.61(6)	0.64(5)
2011-12	Madhya Pradesh	0.71(4)	0.50(9)	0.46(7)	0.88(2)	0.75(3)	0.48(11)	0.63(6)
2011-12	Maharashtra	0.44(10)	0.94(4)	0.43(8)	0.59(12)	0.51(10)	0.73(4)	0.61(7)
2011-12	Goa	0.46(9)	0.38(12)	0.72(3)	0.75(4)	0.73(4)	0.38(13)	0.57(8)
2011-12	Gujarat	0.42(12)	0.96(3)	0.35(12)	0.55(13)	0.38(13)	0.52(9)	0.53(9)
2011-12	Orissa	0.31(13)	0.28(14)	0.42(11)	0.68(5)	0.50(11)	0.59(8)	0.46(10)
2011-12	Rajasthan	0.23(14)	0.43(10)	0.42(9)	0.63(9)	0.52(8)	0.50(10)	0.46(11)
2011-12	Jharkhand	0.17(15)	0.12(16)	0.50(6)	0.67(7)	0.56(7)	0.59(7)	0.43(12)
2011-12	Kerala	0.72(3)	0.75(5)	0.04(16)	0.25(15)	0.22(15)	0.38(14)	0.39(13)
2011-12	Bihar	0.10(16)	0.00(17)	0.42(10)	0.62(11)	0.50(12)	0.42(12)	0.34(14)
2011-12	Uttar Pradesh	0.54(8)	0.35(13)	0.13(15)	0.49(14)	0.23(14)	0.08(16)	0.30(15)
2011-12	Punjab	0.61(6)	0.69(7)	0.00(17)	0.02(16)	0.00(17)	0.28(15)	0.27(16)
2011-12	West Bengal	0.00(17)	0.21(15)	0.15(14)	0.00(17)	0.15(16)	0.00(17)	0.09(17)

Source: Authors' own calculation based on data from State Finance: A Study of Budgets, Reserve Bank of India

Note: Figures in the parentheses represent the relative ranking of the states among 17 general category states of India.

Appendix Table: 2

Indicators of Fiscal Performance for the Year 2010-11

Year	State	Own Tax Earning Performance Index	Own Tax Spending Performance Index	Development Expenditure Performance Index	Commitment Capacity Performance Index	Committed Expenditure Performance Index	Debt Performance Index	Fiscal Performance Index
2010-11	Karnataka	1.00(1)	1.00(1)	1.00(1)	0.96(2)	1.00(1)	0.70(5)	0.94(1)
2010-11	Chhattisgarh	0.69(6)	0.46(10)	0.96(2)	1.00(1)	0.97(2)	1.00(1)	0.84(2)
2010-11	Madhya Pradesh	0.75(3)	0.48(9)	0.60(9)	0.94(3)	0.86(3)	0.47(11)	0.68(3)
2010-11	Tamil Nadu	0.79(2)	0.88(3)	0.45(12)	0.62(12)	0.49(11)	0.82(3)	0.67(4)
2010-11	Maharashtra	0.51(8)	0.98(2)	0.56(10)	0.66(9)	0.51(10)	0.77(4)	0.67(5)
2010-11	Haryana	0.38(12)	0.74(6)	0.68(4)	0.64(11)	0.64(5)	0.93(2)	0.67(6)
2010-11	Andhra Pradesh	0.69(5)	0.70(7)	0.63(6)	0.72(6)	0.57(8)	0.66(6)	0.66(7)
2010-11	Goa	0.38(11)	0.42(12)	0.78(3)	0.87(4)	0.72(4)	0.51(10)	0.61(8)
2010-11	Gujarat	0.48(10)	0.83(4)	0.61(8)	0.58(13)	0.53(9)	0.59(7)	0.60(9)
2010-11	Orissa	0.26(14)	0.27(14)	0.62(7)	0.81(5)	0.61(7)	0.58(9)	0.53(10)
2010-11	Rajasthan	0.32(13)	0.45(11)	0.50(11)	0.65(10)	0.45(12)	0.44(12)	0.47(11)
2010-11	Jharkhand	0.14(15)	0.08(16)	0.63(5)	0.71(7)	0.62(6)	0.59(8)	0.46(12)
2010-11	Kerala	0.72(4)	0.81(5)	0.18(16)	0.36(15)	0.18(15)	0.39(13)	0.44(13)
2010-11	Bihar	0.11(16)	0.00(17)	0.40(13)	0.71(8)	0.32(13)	0.30(15)	0.31(14)
2010-11	Uttar Pradesh	0.49(9)	0.28(13)	0.22(15)	0.49(14)	0.12(15)	0.11(16)	0.28(15)
2010-11	Punjab	0.59(7)	0.56(8)	0.00(17)	0.17(16)	0.00(17)	0.30(14)	0.27(16)
2010-11	West Bengal	0.00(17)	0.15(15)	0.26(14)	0.00(17)	0.05(16)	0.00(17)	0.08(17)

Source: Authors' own calculation based on data from State Finance: A Study of Budgets, Reserve Bank of India

Note: Figures in the parentheses represent the relative ranking of the states among 17 general category states of India.

Appendix Table: 3

Indicators of Fiscal Performance for the Year 2009-10

Year	State	Own Tax Earning Performance Index	Own Tax Spending Performance Index	Development Expenditure Performance Index	Commitment Capacity Performance Index	Committed Expenditure Performance Index	Debt Performance Index	Fiscal Performance Index
2009-10	Karnataka	1.00(1)	1.00(1)	0.84(2)	0.94(3)	0.77(3)	0.81(4)	0.89(1)
2009-10	Chhattisgarh	0.61(6)	0.42(11)	1.09(1)	1.00(1)	0.87(2)	0.99(2)	0.81(2)
2009-10	Tamil Nadu	0.70(2)	0.93(3)	0.47(9)	0.72(11)	0.45(9)	0.87(3)	0.69(3)
2009-10	Haryana	0.35(13)	0.70(7)	0.71(3)	0.71(12)	0.60(5)	1.00(1)	0.68(4)
2009-10	Maharashtra	0.53(7)	0.95(2)	0.55(6)	0.73(10)	0.50(7)	0.71(5)	0.66(5)
2009-10	Andhra Pradesh	0.65(5)	0.78(5)	0.58(5)	0.79(7)	0.47(8)	0.64(6)	0.65(6)
2009-10	Madhya Pradesh	0.69(4)	0.59(8)	0.49(8)	0.93(4)	0.62(4)	0.50(10)	0.64(7)
2009-10	Rajasthan	0.40(10)	0.41(12)	0.39(13)	0.99(2)	1.00(1)	0.26(14)	0.58(8)
2009-10	Goa	0.38(12)	0.43(10)	0.66(4)	0.79(6)	0.54(6)	0.58(8)	0.56(9)
2009-10	Gujarat	0.41(9)	0.76(6)	0.53(7)	0.62(14)	0.40(10)	0.54(9)	0.54(10)
2009-10	Jharkhand	0.27(14)	0.19(15)	0.43(12)	0.80(5)	0.33(13)	0.61(7)	0.44(11)
2009-10	Kerala	0.70(3)	0.80(4)	0.15(16)	0.44(15)	0.14(14)	0.39(12)	0.44(12)
2009-10	Orissa	0.26(15)	0.27(14)	0.44(10)	0.75(9)	0.36(11)	0.47(11)	0.43(13)
2009-10	Bihar	0.14(16)	0.00(17)	0.44(11)	0.77(8)	0.35(12)	0.17(15)	0.31(14)
2009-10	Uttar Pradesh	0.46(8)	0.33(13)	0.18(15)	0.62(13)	0.04(16)	0.04(16)	0.28(15)
2009-10	Punjab	0.39(11)	0.48(9)	0.00(17)	0.38(16)	0.10(15)	0.29(13)	0.27(16)
2009-10	West Bengal	0.00(17)	0.10(16)	0.22(14)	0.00(17)	0.00(17)	0.00(17)	0.05(17)

Source: Authors' own calculation based on data from State Finance: A Study of Budgets, Reserve Bank of India

Note: Figures in the parentheses represent the relative ranking of the states among 17 general category states of India

Appendix Table: 4

Indicators of Fiscal Performance for the Year 2008-09

Year	State	Own Tax Earning Performance Index	Own Tax Spending Performance Index	Development Expenditure Performance Index	Commitment Capacity Performance Index	Committed Expenditure Performance Index	Debt Performance Index	Fiscal Performance Index
2008-09	Chhattisgarh	0.55(7)	0.56(9)	1.00(1)	1.00(1)	1.00(1)	1.00(1)	0.85(1)
2008-09	Karnataka	1.00(1)	0.95(2)	0.75(5)	0.82(4)	0.75(2)	0.83(4)	0.85(2)
2008-09	Haryana	0.46(13)	0.75(5)	0.84(2)	0.69(9)	0.75(3)	0.95(2)	0.74(3)
2008-09	Andhra Pradesh	0.77(4)	0.69(7)	0.79(3)	0.76(5)	0.69(4)	0.67(6)	0.73(4)
2008-09	Tamil Nadu	0.89(2)	0.88(3)	0.48(12)	0.65(10)	0.45(9)	0.87(3)	0.70(5)
2008-09	Maharashtra	0.57(6)	1.00(1)	0.55(8)	0.70(8)	0.46(8)	0.75(5)	0.67(6)
2008-09	Goa	0.52(8)	0.59(8)	0.76(4)	0.75()6()	0.65(5)	0.56(8)	0.64(7)
2008-09	Madhya Pradesh	0.57(5)	0.52(10)	0.51(10)	0.83(2)	0.64(6)	0.50(10)	0.59(8)
2008-09	Gujarat	0.47(12)	0.83(4)	0.59(7)	0.61(12)	0.43(11)	0.52(9)	0.57(9)
2008-09	Orissa	0.25(15)	0.34(13)	0.64(6)	0.82(3)	0.58(7)	0.45(12)	0.51(10)
2008-09	Jharkhand	0.34(14)	0.24(15)	0.54(9)	0.65(11)	0.43(10)	0.64(7)	0.47(11)
2008-09	Rajasthan	0.48(9)	0.47(12)	0.47(13)	0.54(14)	0.35(13)	0.28(14)	0.43(12)
2008-09	Kerala	0.78(3)	0.74(6)	0.16(16)	0.22(15)	0.04(16)	0.46(11)	0.40(13)
2008-09	Uttar Pradesh	0.47(10)	0.34(14)	0.36(15)	0.54(13)	0.26(14)	0.00(17)	0.33(14)
2008-09	Bihar	0.03(16)	0.00(17)	0.50(11)	0.71(7)	0.36(12)	0.13(15)	0.29(15)
2008-09	Punjab	0.47(11)	0.50(11)	0.00(17)	0.15(16)	0.00(17)	0.33(13)	0.24(16)
2008-09	West Bengal	0.00(17)	0.13(16)	0.37(14)	0.00(17)	0.14(15)	0.02(16)	0.11(17)

Source: Authors' own calculation based on data from State Finance: A Study of Budgets, Reserve Bank of India

Note: Figures in the parentheses represent the relative ranking of the states among 17 general category states of India.

Appendix Table: 4

Indicators of Fiscal Performance for the Year 2008-09

Year	State	Own Tax Earning Performance Index	Own Tax Spending Performance Index	Development Expenditure Performance Index	Commitment Capacity Performance Index	Committed Expenditure Performance Index	Debt Performance Index	Fiscal Performance Index
2008-09	Chhattisgarh	0.55(7)	0.56(9)	1.00(1)	1.00(1)	1.00(1)	1.00(1)	0.85(1)
2008-09	Karnataka	1.00(1)	0.95(2)	0.75(5)	0.82(4)	0.75(2)	0.83(4)	0.85(2)
2008-09	Haryana	0.46(13)	0.75(5)	0.84(2)	0.69(9)	0.75(3)	0.95(2)	0.74(3)
2008-09	Andhra Pradesh	0.77(4)	0.69(7)	0.79(3)	0.76(5)	0.69(4)	0.67(6)	0.73(4)
2008-09	Tamil Nadu	0.89(2)	0.88(3)	0.48(12)	0.65(10)	0.45(9)	0.87(3)	0.70(5)
2008-09	Maharashtra	0.57(6)	1.00(1)	0.55(8)	0.70(8)	0.46(8)	0.75(5)	0.67(6)
2008-09	Goa	0.52(8)	0.59(8)	0.76(4)	0.75()6()	0.65(5)	0.56(8)	0.64(7)
2008-09	Madhya Pradesh	0.57(5)	0.52(10)	0.51(10)	0.83(2)	0.64(6)	0.50(10)	0.59(8)
2008-09	Gujarat	0.47(12)	0.83(4)	0.59(7)	0.61(12)	0.43(11)	0.52(9)	0.57(9)
2008-09	Orissa	0.25(15)	0.34(13)	0.64(6)	0.82(3)	0.58(7)	0.45(12)	0.51(10)
2008-09	Jharkhand	0.34(14)	0.24(15)	0.54(9)	0.65(11)	0.43(10)	0.64(7)	0.47(11)
2008-09	Rajasthan	0.48(9)	0.47(12)	0.47(13)	0.54(14)	0.35(13)	0.28(14)	0.43(12)
2008-09	Kerala	0.78(3)	0.74(6)	0.16(16)	0.22(15)	0.04(16)	0.46(11)	0.40(13)
2008-09	Uttar Pradesh	0.47(10)	0.34(14)	0.36(15)	0.54(13)	0.26(14)	0.00(17)	0.33(14)
2008-09	Bihar	0.03(16)	0.00(17)	0.50(11)	0.71(7)	0.36(12)	0.13(15)	0.29(15)
2008-09	Punjab	0.47(11)	0.50(11)	0.00(17)	0.15(16)	0.00(17)	0.33(13)	0.24(16)
2008-09	West Bengal	0.00(17)	0.13(16)	0.37(14)	0.00(17)	0.14(15)	0.02(16)	0.11(17)

Source: Authors' own calculation based on data from State Finance: A Study of Budgets, Reserve Bank of India

Note: Figures in the parentheses represent the relative ranking of the states among 17 general category states of India.

Appendix Table: 6

Indicators of Fiscal Performance for the Year 2006-07

Year	State	Own Tax Earning Performance Index	Own Tax Spending Performance Index	Development Expenditure Performance Index	Commitment Capacity Performance Index	Committed Expenditure Performance Index	Debt Performance Index	Fiscal Performance Index
2006-07	Karnataka	1.00(1)	0.98(2)	0.83(5)	0.94(2)	1.00(1)	0.92(4)	0.95(1)
2006-07	Haryana	0.69(3)	0.89(3)	1.00(1)	0.89(3)	0.92(3)	0.95(3)	0.89(2)
2006-07	Chhattisgarh	0.54(7)	0.71(8)	0.89(3)	1.00(1)	0.98(2)	1.00(1)	0.86(3)
2006-07	Tamil Nadu	0.76(2)	1.00(1)	0.40(11)	0.70(9)	0.57(9)	0.97(2)	0.73(4)
2006-07	Goa	0.59(5)	0.62(9)	0.89(4)	0.82(4)	0.82(5)	0.58(9)	0.72(5)
2006-07	Andhra Pradesh	0.61(4)	0.72(6)	0.60(6)	0.73(7)	0.64(8)	0.71(7)	0.67(6)
2006-07	Maharashtra	0.44(10)	0.86(4)	0.41(9)	0.72(8)	0.69(7)	0.81(5)	0.65(7)
2006-07	Jharkhand	0.10(15)	0.16(16)	0.92(2)	0.74(6)	0.87(4)	0.80(6)	0.60(8)
2006-07	Madhya Pradesh	0.50(8)	0.51(11)	0.44(7)	0.82(5)	0.71(6)	0.46(11)	0.57(9)
2006-07	Gujarat	0.38(13)	0.82(5)	0.41(10)	0.63(12)	0.43(12)	0.65(8)	0.56(10)
2006-07	Rajasthan	0.43(12)	0.51(12)	0.42(8)	0.62(13)	0.47(10)	0.30(12)	0.46(11)
2006-07	Kerala	0.58(6)	0.71(7)	0.12(15)	0.40(16)	0.34(14)	0.58(10)	0.45(12)
2006-07	Uttar Pradesh	0.44(11)	0.41(13)	0.27(13)	0.63(11)	0.40(13)	0.04(16)	0.36(13)
2006-07	Punjab	0.47(9)	0.55(10)	0.00(17)	0.42(15)	0.31(15)	0.25(14)	0.33(14)
2006-07	Orissa	0.30(14)	0.36(14)	0.20(14)	0.59(14)	0.21(16)	0.26(13)	0.32(15)
2006-07	Bihar	0.00(17)	0.00(17)	0.40(12)	0.68(10)	0.44(11)	0.00(17)	0.25(16)
2006-07	West Bengal	0.07(16)	0.28(15)	0.08(16)	0.00(17)	0.00(17)	0.12(15)	0.09(17)

Source: Authors' own calculation based on data from State Finance: A Study of Budgets, Reserve Bank of India

Note: Figures in the parentheses represent the relative ranking of the states among 17 general category states of India.

Appendix Table: 7

Indicators of Fiscal Performance for the Year 2005-06

Year	State	Own Tax Earning Performance Index	Own Tax Spending Performance Index	Development Expenditure Performance Index	Commitment Capacity Performance Index	Committed Expenditure Performance Index	Debt Performance Index	Fiscal Performance Index
2005-06	Maharashtra	0.50(11)	1.00(1)	0.55(7)	1.00(1)	0.80(3)	0.87(6)	0.79(1)
2005-06	Chhattisgarh	0.63(6)	0.25(7)	1.00(1)	0.87(2)	1.00(1)	0.96(4)	0.79(2)
2005-06	Karnataka	1.00(1)	0.34(4)	0.63(5)	0.83(3)	0.95(2)	0.96(3)	0.78(3)
2005-06	Haryana	0.77(3)	0.37(3)	0.65(4)	0.77(4)	0.74(6)	0.96(5)	0.71(4)
2005-06	Tamil Nadu	0.91(2)	0.38(2)	0.40(10)	0.70(5)	0.59(8)	0.99(2)	0.66(5)
2005-06	Goa	0.64(5)	0.22(9)	0.80(2)	0.73(6)	0.76(5)	0.70(9)	0.64(6)
2005-06	Andhra Pradesh	0.61(7)	0.26(6)	0.56(6)	0.67(7)	0.59(9)	0.74(8)	0.57(7)
2005-06	Jharkhand	0.08(15)	0.08(15)	0.80(3)	0.65(8)	0.78(4)	1.00(1)	0.56(8)
2005-06	Gujarat	0.40(13)	0.30(5)	0.35(11)	0.58(12)	0.33(13)	0.75(7)	0.45(9)
2005-06	Rajasthan	0.51(10)	0.20(11)	0.47(8)	0.63(9)	0.51(10)	0.33(12)	0.44(10)
2005-06	Kerala	0.54(9)	0.24(8)	0.26(13)	0.46(15)	0.33(14)	0.66(10)	0.42(11)
2005-06	Punjab	0.76(4)	0.22(10)	0.00(17)	0.60(10)	0.48(11)	0.29(14)	0.39(12)
2005-06	Madhya Pradesh	0.58(8)	0.00(17)	0.42(9)	0.00(17)	0.72(7)	0.53(11)	0.38(13)
2005-06	Uttar Pradesh	0.41(12)	0.16(12)	0.27(12)	0.58(11)	0.36(12)	0.19(16)	0.33(14)
2005-06	Orissa	0.30(14)	0.13(13)	0.18(15)	0.54(14)	0.12(16)	0.29(15)	0.26(15)
2005-06	Bihar	0.00(17)	0.02(16)	0.25(14)	0.56(13)	0.22(15)	0.00(17)	0.17(16)
2005-06	West Bengal	0.04(16)	0.11(14)	0.12(16)	0.26(16)	0.00(17)	0.33(13)	0.14(17)

Source: Authors' own calculation based on data from State Finance: A Study of Budgets, Reserve Bank of India

Note: Figures in the parentheses represent the relative ranking of the states among 17 general category states of India.

Appendix Table: 8

Indicators of Fiscal Performance for the Year 2004-05

Year	State	Own Tax Earning Performance Index	Own Tax Spending Performance Index	Development Expenditure Performance Index	Commitment Capacity Performance Index	Committed Expenditure Performance Index	Debt Performance Index	Fiscal Performance Index
2004-05	Karnataka	1.00(1)	0.96(3)	0.52(4)	1.00(1)	1.00(1)	0.79(5)	0.88(1)
2004-05	Haryana	0.67(3)	0.97(2)	0.43(7)	0.84(5)	0.79(6)	0.81(3)	0.75(2)
2004-05	Tamil Nadu	0.86(2)	1.00(1)	0.39(10)	0.77(8)	0.65(8)	0.80(4)	0.74(3)
2004-05	Goa	0.48(10)	0.49(9)	1.00(1)	0.90(4)	0.97(2)	0.60(8)	0.74(4)
2004-05	Chhattisgarh	0.48(9)	0.52(8)	0.76(3)	0.92(2)	0.89(5)	0.83(2)	0.73(5)
2004-05	Maharashtra	0.60(5)	0.85(4)	0.39(11)	0.78(7)	0.96(3)	0.74(6)	0.72(6)
2004-05	Andhra Pradesh	0.57(6)	0.67(7)	0.50(6)	0.70(9)	0.63(9)	0.65(7)	0.62(7)
2004-05	Jharkhand	0.00(17)	0.13(16)	0.83(2)	0.81(6)	0.91(4)	1.00(1)	0.62(8)
2004-05	Madhya Pradesh	0.51(8)	0.47(10)	0.41(9)	0.91(3)	0.76(7)	0.51(11)	0.59(9)
2004-05	Gujarat	0.42(12)	0.70(5)	0.50(5)	0.61(12)	0.62(10)	0.60(9)	0.58(10)
2004-05	Kerala	0.62(4)	0.67(6)	0.31(12)	0.47(15)	0.50(13)	0.54(10)	0.52(11)
2004-05	Rajasthan	0.46(11)	0.45(11)	0.42(8)	0.64(10)	0.56(12)	0.28(12)	0.47(12)
2004-05	Punjab	0.56(7)	0.40(12)	0.00(17)	0.54(13)	0.56(11)	0.21(15)	0.38(13)
2004-05	Orissa	0.24(14)	0.25(15)	0.11(13)	0.51(14)	0.19(15)	0.23(14)	0.25(14)
2004-05	Uttar Pradesh	0.36(13)	0.28(14)	0.11(14)	0.39(16)	0.23(14)	0.11(16)	0.25(15)
2004-05	Bihar	0.05(16)	0.00(17)	0.10(15)	0.62(11)	0.15(16)	0.00(17)	0.15(16)
2004-05	West Bengal	0.13(15)	0.29(13)	0.03(16)	0.00(17)	0.00(17)	0.25(13)	0.12(17)

Source: Authors' own calculation based on data from State Finance: A Study of Budgets, Reserve Bank of India

Note: Figures in the parentheses represent the relative ranking of the states among 17 general category states of India.

Appendix Table: 9

Indicators of Fiscal Performance for the Year 2003-04

Year	State	Own Tax Earning Performance Index	Own Tax Spending Performance Index	Development Expenditure Performance Index	Commitment Capacity Performance Index	Committed Expenditure Performance Index	Debt Performance Index	Fiscal Performance Index
2003-04	Karnataka	1.00(1)	0.90(4)	0.30(10)	0.91(3)	0.80(3)	0.88(6)	0.80(1)
2003-04	Chhattisgarh	0.33(13)	0.38(11)	1.00(1)	1.00(1)	1.00(1)	1.00(1)	0.78(2)
2003-04	Haryana	0.66(5)	0.95(2)	0.37(8)	0.81(5)	0.65(6)	0.92(4)	0.73(3)
2003-04	Goa	0.41(10)	0.47(8)	0.85(2)	0.93(2)	0.83(2)	0.77(9)	0.71(4)
2003-04	Tamil Nadu	0.85(2)	1.00(1)	0.28(11)	0.66(10)	0.49(12)	0.94(3)	0.70(5)
2003-04	Maharashtra	0.62(6)	0.90(3)	0.24(13)	0.76(6)	0.75(5)	0.89(5)	0.69(6)
2003-04	Andhra Pradesh	0.58(7)	0.64(7)	0.47(5)	0.75(7)	0.57(9)	0.80(7)	0.64(7)
2003-04	Gujarat	0.40(11)	0.68(6)	0.56(3)	0.74(8)	0.62(7)	0.74(10)	0.62(8)
2003-04	Madhya Pradesh	0.42(9)	0.28(12)	0.55(4)	0.72(9)	0.78(4)	0.79(8)	0.59(9)
2003-04	Kerala	0.83(3)	0.81(5)	0.25(12)	0.52(14)	0.42(14)	0.65(11)	0.58(10)
2003-04	Jharkhand	0.00(17)	0.22(14)	0.44(7)	0.83(4)	0.54(10)	0.97(2)	0.50(11)
2003-04	Rajasthan	0.44(8)	0.44(9)	0.30(9)	0.58(12)	0.44(13)	0.44(12)	0.44(12)
2003-04	Punjab	0.68(4)	0.41(10)	0.00(17)	0.59(11)	0.49(11)	0.26(16)	0.41(13)
2003-04	Uttar Pradesh	0.33(12)	0.08(15)	0.46(6)	0.41(15)	0.59(8)	0.29(15)	0.36(14)
2003-04	Orissa	0.06(16)	0.06(16)	0.15(16)	0.38(16)	0.22(15)	0.32(14)	0.20(15)
2003-04	Bihar	0.11(14)	0.00(17)	0.12(15)	0.56(13)	0.19(16)	0.00(17)	0.16(16)
2003-04	West Bengal	0.11(15)	0.27(13)	0.00(16)	0.00(17)	0.00(17)	0.37(13)	0.12(17)

Source: Authors' own calculation based on data from State Finance: A Study of Budgets, Reserve Bank of India

Note: Figures in the parentheses represent the relative ranking of the states among 17 general category states of India.

Appendix Table: 10

Indicators of Fiscal Performance for the Year 2002-03

Year	State	Own Tax Earning Performance Index	Own Tax Spending Performance Index	Development Expenditure Performance Index	Commitment Capacity Performance Index	Committed Expenditure Performance Index	Debt Performance Index	Fiscal Performance Index
2002-03	Karnataka	0.97(2)	0.90(4)	0.73(5)	0.80(6)	0.70(6)	0.88(6)	0.83(1)
2002-03	Chhattisgarh	0.57(10)	0.56(9)	1.00(1)	0.96(2)	0.84(2)	0.95(2)	0.81(2)
2002-03	Tamil Nadu	1.00(1)	0.91(3)	0.63(6)	0.71(9)	0.63(7)	0.94(3)	0.80(3)
2002-03	Haryana	0.83(4)	1.00(1)	0.56(8)	0.81(5)	0.61(9)	0.89(4)	0.78(4)
2002-03	Maharashtra	0.72(8)	0.92(2)	0.46(10)	0.76(7)	0.78(3)	0.88(5)	0.75(5)
2002-03	Madhya Pradesh	0.74(7)	0.57(8)	0.76(3)	0.86(4)	0.72(5)	0.69(8)	0.72(6)
2002-03	Andhra Pradesh	0.76(6)	0.72(6)	0.59(7)	0.71(10)	0.50(10)	0.77(7)	0.67(7)
2002-03	Jharkhand	0.18(15)	0.25(15)	0.87(2)	0.89(3)	0.72(4)	1.00(1)	0.65(8)
2002-03	Gujarat	0.53(11)	0.62(7)	0.73(4)	0.73(8)	0.62(8)	0.65(10)	0.65(9)
2002-03	Kerala	0.91(3)	0.75(5)	0.45(11)	0.47(15)	0.41(11)	0.63(11)	0.60(10)
2002-03	Goa	0.23(14)	0.26(14)	0.45(12)	1.00(1)	1.00(1)	0.66(9)	0.60(11)
2002-03	Rajasthan	0.62(9)	0.43(12)	0.47(9)	0.53(13)	0.41(12)	0.22(13)	0.45(12)
2002-03	Uttar Pradesh	0.49(12)	0.48(10)	0.33(14)	0.57(11)	0.31(14)	0.18(14)	0.39(13)
2002-03	Punjab	0.78(5)	0.47(11)	0.00(17)	0.49(14)	0.39(13)	0.16(15)	0.38(14)
2002-03	Orissa	0.28(13)	0.23(16)	0.34(13)	0.54(12)	0.26(15)	0.00(17)	0.27(15)
2002-03	Bihar	0.00(17)	0.00(17)	0.27(15)	0.46(16)	0.15(16)	0.06(16)	0.16(16)
2002-03	West Bengal	0.10(16)	0.27(13)	0.16(16)	0.00(17)	0.00(17)	0.32(12)	0.14(17)

Source: Authors' own calculation based on data from State Finance: A Study of Budgets, Reserve Bank of India

Note: Figures in the parentheses represent the relative ranking of the states among 17 general category states of India.

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