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Essays in Fiscal Policy and Budgeting

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To
Babun and Ma

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SUMMARY

Tax competition literature predicts a world where countries will suppress taxes on mobile capital to attract it from elsewhere. Do the countries of South East Asia interact with each other strategically and compete when setting corporate taxes or do they compete for capital through other incentives? Data was collected from World Bank and American Enterprise Institute to model the tax interaction across these countries as a spatially dependent process. Findings indicate that these countries compete in terms of taxes amongst themselves only to a limited extent, but try to attract capital through non-tax incentives. Moreover, the spread of production processes by MNCs in these countries are such that they can act as a block to attract capital from the rest of the world, while not competing too much amongst them.

Does Soft Budget Constraint exist in Indian State finances? If it does what is its extent and how does it manifest itself? Using data from Reserve Bank of India and Ministry of Finance sources our analysis indicate that states in India do indeed enjoy the benefits of soft budget constraint and expect the Central government to bail them out through regular resource transfers.

Can the Theory of Punctuated Equilibrium of policy making explain the pattern of jumps and stasis in Indian state budgets? Or can explanations like political business cycle and forecast error correction be sufficient to explain such patterns? A detailed study of the annual budgetary changes indicate that although such competing explanations can partly explain the pattern, but still the Punctuated Equilibrium Theory is strongly applicable in explaining the leptokurtic pattern of annual budgetary changes in India.

Chapter 1: Introduction

Strategic interaction across governments – both vertically and horizontally – creates externalities. Tax competition literature has long predicted a global race to the bottom in terms of corporate taxes while the literature on soft budget constraint point to strategic interaction across government as the source of the softening of the budget constraints. Both of these phenomena can be thought of as negative externalities originating from the strategic interactions. In this dissertation I have looked at the empirical evidence of such strategic interaction.

In the first essay, I have searched for strategic interaction corporate tax policy among the countries of south East Asia. This is part and extension of the scholarship about corporate tax interaction in EU and OECD countries. My first question was whether we can find empirical evidence of strategic interaction among the countries of South East Asia and my second question was whether this interaction, if found, is of Nash or Stackelberg type. I used spatial dynamic autoregressive panel model for the analysis. There is evidence of interaction but there is no clear leader in my sample. Of course China, Japan, and South Korea could well be the leaders if we expand the region, but those countries are vastly different from my sample. However, there is evidence that the countries in my sample are competing through non-tax incentives to attract capital. Finally, an analysis of the trade patterns among these countries indicates one important pattern. The trade among these countries is in intermediate goods, which means MNCs are spreading their production process across the region and taking benefit of transfer pricing mechanisms.

In my second essay, I have searched for empirical evidence of Soft Budget Constraint in Indian state budgets. Soft Budget Constraint (SBC) exists when any state consistently behaves in a fiscally irresponsible way and believes that resource transfer from the center will bail it out. There have been allegations that SBC exists in Indian state budgets but yet no empirical attempt to search for its evidence. I looked for evidence of strategic behavior of states with respect to both Finance Commission and erstwhile Planning Commission. At the same time I also searched for evidence of states trying to replicate neighboring states in their incurring of deficits. The idea is that if SBC is there then State A would think well state B is not being punished for deficits then why should I be. There is clear evidence of SBC. Moreover it is not stemming from a mimicking behavior in sector specific expenditures.

Finally the third essay looks at Indian state budget through the lens of Punctuated Equilibrium Theory (PET). Can this theory be applied to Indian policy making in general and budgets in particular? The answer that I found is yes it does. The year to year change in budgeted revenue expenditure is strongly consistent with the leptokurtic pattern predicted by Punctuated Equilibrium Theory of policy making. Moreover, forecast error correction and other explanations like political business cycle, although explains part of the pattern, but still cannot completely substitute PET as the explanation to the year to year budget changes.

Chapter 2: Essay 1 – In Search of Strategic Interaction in Corporate Tax among the Countries of South East Asia

2.1. Introduction

Over the last couple of decades the pattern of global integration has meant that both commodities and factors of production (including Foreign Direct Investment or FDI) have become increasingly more mobile across borders (Hines Jr., 2005; Frankel, 1992, 1993; Obstfeld, 1993). Not only has FDI become more mobile across borders, its responsiveness to tax policy has also become high. Studies trying to estimate the responsiveness of FDI to yearly changes in after-tax rates of return generally find that the elasticity of FDI with respect to after-tax returns is close to unity (Hines Jr., 2005). Hartman (1984), Boskin & Gale, (1987), Young (1988), Murthy (1989), Grubert and Mutti (1991), and Hines and Rice (1994) among others have all found that FDI has been or become quite tax sensitive across the world. Altshuler, Grubert, & Newlon (2002) estimates that the tax sensitivity of FDI has increased over the period 1984-1992. According to the estimates of Altshuler and Grubert (2004) this elasticity seems to have continued to increase over time. Other studies that have found similar effects of taxes on FDI include Hines (1996), and Gorter and Parikh (2000). Globalization is thus making government policies across countries interdependent. This interdependence across countries especially in the context of corporate and income tax and specifically for the countries of Organization for Economic Co-operation and Development (OECD) and European Union has elicited both theoretical and practical interests. Large bodies of both theoretical research (see for example Zodrow, 2003 or Wilson, 1999 for surveys) and empirical research (see for example Griffith and Klemm, 2004, Genschel, 2011, or Adam

et. al., 2013 for surveys) have developed to study and understand these issues. The conclusions reached by the theoretical literature are that the tax burden on capital is likely to be lower in relatively smaller countries, while the burden on the immobile factors such as labor and land is likely to be higher. It has also been concluded that the constraint on tax revenue implies that social services loose out vis-a-vis infrastructural spending as countries tend to compete with each other through the improvement of available public inputs. The evidences found by the empirical works are however mixed. Some find that there is a strong indication that corporate tax policies in these countries are strategic complements of each other, while others do not find any such evidence. Nevertheless, the prospect of sovereign countries of EU losing control over a traditional source of tax revenue has caught the attention of the policy makers in Europe, and elsewhere.

There are several ingenious ways to avoid the tax burden of capital and corporate taxes in a high tax country. In addition to actually shifting physical capital (which is a time consuming process), multinationals often engage in tax avoidance activities like – debt financing, profit shifting, and transfer pricing (Hallerberg and Basinger, 1998). Evidences from an International Monetary Fund (IMF) study (Gropp & Kostial, 2001) show that Multinational Corporations (MNCs) spend a substantial amount of economic resources in tax planning (for example employing consultancy companies to determine transfer pricing) which can reduce their global tax liabilities. By using debt instead of equity financing multinationals can reduce the tax burden on subsidiaries in countries with higher corporate tax rates. The amount of debt in the financial structure of the subsidiary determines the interest payment to the parent unit which is generally deductible for the purposes of tax calculation in most countries and a high interest

payment reduces the tax payable. Hines and Hubbard (1990), Grubert (1998), and Desai et. al. (2004) among others find evidence that American multinationals engage in these financial restructuring of their affiliates and subsidiaries. The subsidiaries, which are debt financed (or have high debt levels), are more often located in high tax countries relative to the subsidiaries which are equity financed. Although these studies use data from US multinationals, there is no logical reason to suspect that multinationals from other industrialized countries will behave any differently. All in all these studies support the conjecture that the flow of foreign capital and the business practices pursued by Multinational investors are responsive to tax policies of the countries where they are operating. According to OECD estimates these types of activities result in annual global losses of anywhere between 4-10 percent of global Corporate Income Tax. The OECD is attempting to prevent such exploitation of the tax rules through its Base Erosion and Profit Shifting (BEPS) initiative. Not only within the OECD, the BEP initiative is trying to engage the developing countries as well.

All these evidences of increasing mobility of capital across border and capital's responsiveness to corporate tax rates have given rise to the possibility of countries or sub-national jurisdictions within countries (as in the case of some federal countries) competing with each other in terms of tax rates to attract the footloose capital[1]. The creation of regional blocs like Andean Community and MERCOSUR in South America, ECOWAS in West Africa and ASEAN in South East Asia is shaping and reshaping the pattern of international trade and movement of capital. Thus the analysis of tax

[1] As an addition weak point, the developing and transition countries also suffer from weak tax administration leading to inadequacy of tax revenue for the running of the governments. Therefore, the alleged ills of tax competition are far more severe for developing and transition countries.

competition and strategic interaction within these blocs has become important issues for serious consideration. Although the issue of strategic interaction in corporate tax has been widely studied in the context of EU, there have been fewer studies for other comparable supra national associations and regions of the world.

In particular, the south-east Asian countries have been destinations of footloose capital for last two decades. Foreign Direct Investment (FDI) in these countries has not only created new tax bases but has also been the engine of rapid growth. The countries in this region have increasingly become the manufacturing hub of the world. Cheap labor in conjunction with encouraging industrial policies has drawn both newer technology industries and traditional industries (for example textile) to this region. However, we do not know much about the tax interaction among these countries and geopolitical entities[2]. What does the experience of European Union countries in terms of interdependency of corporate tax setting has to offer to these countries? To bridge this gap the main goal of this paper is to empirically investigate whether there is evidence of strategic interaction in corporate taxes among the countries and geopolitical entities of the south east Asian region.

2.2. Literature Review

Oates (1972)[3] first informally discussed the interjurisdictional competition for capital. It was, however, Zodrow and Mieszkowski (1986) and Wilson (1986) who gave a formal treatment to interjurisdictional tax competition and its effects. This seminal

[2] In this region we have Hong Kong SAR which is part of China and although is not a country, but still maintains its own tax rates.
[3] Tiebout (1956) also addresses tax competition but in a different vein.

model, which is sometimes referred to as the WZM model, gave rise to a substantial body of both theoretical and empirical literature on tax competition and its effects. This 'classical' literature on tax competition argued that when there is an immobile factor of production available (which many interpreted as labor) then a source-based tax on the mobile factor (which was interpreted as capital) is inefficient and results in flight of the mobile factor (henceforth capital). With the jurisdictions being 'small' or price takers, the capital flight will continue till the after tax return in the domestic economy is equalized with the net return to capital on foreign economies (Gordon, 1986; Razin and Sadka, 1991). The natural corollary to this line of argument is that the economies being aware of this possibility will reduce capital tax rates to zero (since all jurisdictions are assumed to be identical) and a 'race to the bottom' would ensue. In a different context even the optimal tax literature says that zero tax rate on mobile capital is the efficient rate for small open economies (Diamond and Mirrless, 1971). Moreover, countries with non-zero taxes on foreign investment are predicted to have lower incomes than other countries.

The simple nature of the logic of the WZM model and the policy initiatives that started in Europe would lead an unsuspecting observer to believe that the research on tax competition is unequivocal about the negative effects of tax competition. However, in reality that has not been the case. Looking closely (Zodrow, 2003) we can see that the WZM model crucially depends on several standard but simplifying assumptions. These include the price taking nature of the jurisdictions (countries or subnational regions), a Nash type single period interaction between jurisdictions, fixed supply of factors in each jurisdiction, identical tastes and preferences for all residents in each jurisdictions, a single final commodity, benevolent governments providing a "private" good from the tax

revenues without any spillover, greenfield type capital investment, and only two policy instruments – taxes on capital and head taxes on labor. Once these assumptions are relaxed to make the WZM model more complex the policy conclusions of the expanded models become more nuanced and less unequivocal.

The empirical literature on the existence of tax competition can be grouped into 'first generation' studies and 'second generation' studies. The first generation studies start by taking the mobility of capital as given. They implicitly assumed if a country have fewer restrictions on capital then a measure of openness can be taken as a proxy of the mobility of capital. And if it is found that the measure of openness of the economy (which stands as a proxy for the mobility of capital) negatively affects some measure of corporate tax rate or revenue then one can conclude that there exists tax competition. Even within the 'first generation' studies we can differentiate between two strands – first are the older studies (Garrett, 1995; Quinn, 1997; Slemrod, 2003; Kenny and Winner, 2006) that used the ratio of corporate tax revenue to GDP as the dependent variable and the later studies that started using relatively more sophisticated measures of effective tax rates (Rodrik, 1997; Bretschger and Hettich, 2002; Hays, 2003; Winner 2005; Adam and Kammas, 2007). Interestingly, the first group of studies that use the ratio of corporate tax revenue to GDP as the dependent variable fail to find any evidence in favor of tax competition. The use of this particular dependent variable has been criticized because an increase in tax revenue may result from expansion of base and better tax administration even if the rates are reduced to reduce the burden on each unit of capital. The second group of studies thus used measures of average and marginal tax rates (following the

work of Mendoza, Razin and Tesar, 1994) and started finding that openness is negatively related to different measures of effective tax on capital.

Contrary to what many would like us to believe this literature does not always invariably find that empirical evidence supports the existence of tax competition (even the 'openness leading to lower taxes means competition' type). Several studies using measures of effective taxes similar to the above studies have found that openness can lead to higher effective taxes on capital (Dreher, 2006; Garrett and Mitchell, 2001; Gellany and McCoy, 2001; Swank and Steinmo, 2002; Huizinga and Nicodeme, 2006).

In effect what these 'first generation' studies enquire about is what factors (including openness) affect the ex-post tax revenue or some measure of it. They do not directly estimate the reaction of each country's tax rate (or some indicator of it) to the changes in neighbor's tax rates (or some indicator of it). In other words these studies do not analyze the 'strategic interaction' among countries *per se*.

The 'second generation' studies on the other hand try to incorporate this 'strategic interaction' by estimating the effect of neighbor's (or other countries') tax rates on the measure of the tax rate of the home country or jurisdiction (Heyndels and Vuchelen, 1998; Buettner, 2001; Feld and Reulier 2009, Bordignon et al. 2003; Brett and Pinske, 2000 etc.). There are mainly two types of empirical studies that incorporate the strategic interaction among countries in terms of tax competition. The two types follow closely the early 'strategic interaction' models in the theoretical literature. On the one hand we have the empirical papers that assume the countries to behave as Nash competitors and incorporate some measure of weighted tax from the neighboring or competing countries into the explanatory variables (Devereux, Lockwood, and Redoano, 2008). On the other,

we have the studies that take the Stackelberg leader-follower model as the starting point and incorporate some measure of lagged tax rate of the alleged leader country into the explanatory variables (see Kempf and Rota-Graziosi, 2010; Liu and Martinez-Vazquez, 2011 for theoretical analyses and Liu and Martinez-Vazquez, 2014, Altshuler and Goodspeed, 2014, for empirical studies). The empirical studies that try to incorporate strategic interactions among countries (Brueckner and Saavedra, 2001; Overesch and Rincke, 2009; Redoano, 2003 and 2007) find that corporate taxes are strategically set by the economies in their samples. I have not found any empirical study yet to incorporate the repeated interaction among countries. Given the infancy of the theoretical literature itself this is not something that should surprise us much.

The current literature focuses mainly on OECD or EU countries (either at national level across countries, or at subnational and local levels within countries) or on the states of USA. There are only a few studies for the developing countries and regional country associations other than OECD or EU (for example Chen, Huang and Regis, 2014, IMF, 2014, and Suzuki, 2013). However, for regional groups like ASEAN the issue of tax competition and strategic interaction in tax setting is likely equally salient.

In this paper I attempt to test the existence of strategic interaction in setting corporate taxes among the ASEAN countries and also to explore the possibility that any of the countries within this regional block behaving like a Stackelberg leader. Although the above three works have tried to explore the issue of tax interaction among the countries included in ASEAN (among other countries in their sample), none of them have attempted to test for the existence of a Stackelberg leader in this region.

2.3. Empirical Specification

The empirical strategy of the current literature on tax competition is the estimate a tax reaction function. The tax reaction function expresses a country's tax measure as a function of the tax measures of neighboring countries and other country specific control variables. The standard (Devereux et. al. 2008, Brueckner, 2003, Jacobs et al. 2010, Liu and Martinez-Vazquez, 2014) baseline model is the spatial autoregressive or spatial lag (Anselin, 1988) model of the form:

$$z_{it} = \gamma \sum_{j \neq i} w_{ij} z_{jt} + \beta z_{it-1} + \alpha_x X_{it-1} + \delta_i + T_t + \epsilon_{it} \ldots\ldots\ldots (1)$$

Where z_{it} is the measure of the tax rate in country i in year t, w_{ij} are weights that indicate the relevance of other jurisdictions in the process of interaction, X_{it} is the matrix of country characteristic variables (entered with one period lag signified by the subscript *t-1*) , and ε_{it} is an independently and identically distributed error. This simple spatial autoregressive model assumes that the characteristics of country j do not directly affect the tax variable in country i. The own lagged tax measure z_{it-1} is included in the model to account for the time persistence of tax policy. The other control variables (included in the matrix X_{it-1}) are explained later. We also include a country fixed effect and a time trend. Ideally we would also like to include time fixed effects, but as noted in Devereux et al (2008) that after the inclusion of time dummies in a model of spatial lag the true impact of the control variables cannot be separately identified.

Taxes enter both the right and left hand sides of the reaction function. This gives rise to the possibility of endogeneity. There are three ways to address this issue. First, we can use Maximum Likelihood based estimation (Case et al. 1993; Brueckner and

Saavedra, 2001) using an inverted equation derived from the original model, which is computationally much more cumbersome compared to the other two methods. Otherwise, we can use an estimated instrument in lieu of the weighted sum of taxes and use an Instrumental Variable based two stage least square (2SLS) estimation. Finally, we can use all explanatory variables (including the weighted tax rate of neighbor's) with a one or two period lag and circumvent the problem of endogeneity all together (Hayashi & Boadway, 2001). However, the limited application of this method indicates that a completely temporally lagged model is less accepted as a good way to deal with endogeneity. Therefore, In this paper we have adopted the 2SLS method using Generalized Method of Moments (GMM) estimators.

We have augmented the model by adding a temporally lagged variable which make the model a temporally dynamic model along with being spatially dynamic. We estimate our models using the GMM framework which implies our estimates would not be biased even if we do not specifically model the spatial error dependence. (See for example Liu and Martinez-Vazquez, 2014).

In addition to the Nash model (equation 1 above) we have also explored the possibility of one of the countries in the sample behaving like a Stackelberg leader. To test the existence of a Stackelberg leader we have followed the procedure of Altshuler and Goodspeed (2014) and have augmented the basic equation (1) as follows,

$$z_{it} = \gamma' \sum_{j \neq i} w'_{ij} z_{jt} + \eta z_{Lt-1} + \beta' z_{it-1} + a'_x X_{it-1} + \delta_i + T_t + \epsilon_{it} \ldots\ldots (2)$$

Here, z_{Lt-1} is the one period lagged tax rate of the alleged leader country. This equation uses a weight matrix which excludes the leader country in the computation of the weighted neighbors' tax measure ($\sum_{j \neq i} w'_{ij} z_{jt}$).

As noted earlier, the two model specifications in (1) and (2) introduce two crucial elements of endogeneity. First the introduction of the temporally lagged own tax rate is correlated with the state fixed effects in the composite error term ($\delta_i + \epsilon_{it}$). Secondly, the introduction of the spatially lagged tax rate of the neighbors (which enters our models contemporaneously) makes the tax policy variable endogenous and to be correlated with the error term. In the presence of these endogeneity problems we cannot use OLS or fixed effects estimators. We therefore employ the Blundell and Bond (1998)[4] GMM based dynamic panel data estimator. This estimator takes care of the first endogeneity problem. To address the endogeneity problem associated with the spatially lagged variable we follow the spatial econometrics literature and use exogenous instruments (spatially weighted explanatory variables)[5]. The serial correlations in the residuals are evaluated using the Arellano and Bond (1991) test.

The computation of the weighted average of the neighbor's tax measures requires the use of weight matrices. One would like to estimate the weights endogenously along with the explanatory variable coefficients. But empirically this is not possible due the loss of degrees of freedom. Therefore the methodological strategy employed by the extant literature is to assume a particular a priori structure of the weight matrix. This assumption is an ad hoc condition imposed on the nature of the possible interaction across jurisdictions. The weights are row standardized so that they sum to one for each observation (country). Several different types of weights have been used in the literature

[4] This estimator is also known as the system GMM estimator. There is also a slightly older but estimator based on Arellano and Bond (1991) which is known as the difference GMM.
[5] The estimations are done using xtabond2 estimation command developed by Roodman (2009) for Stata statistical program.

by varying the a priori assumption about the nature of the interaction. These different weighting schemes include,

- Inverse of the Geographical Distance or Proximity Weights (Altshuler and Goodspeed, 2007; Hernandez-Murilo, 2003) which derive their inspiration from the Gravity Models of Trade or Equal Contiguity Weights.

- GDP weights (Devereux, Lockwood, and Redoano, 2008)

- Equal weights (Garretson and Peeters, 2007; Redoano, 2007; Dreher, 2006; Haufler, Klemm and Schjelderup, 2006)

- Demographic similarity weight (Case et. al. 1993)

- Or a mixture of some more that one schemes above (Liu and Martinez-Vazquez, 2014)

The sample region (South East Asia) is a compact geopolitical region with only a few countries. We do not expect any one country making much distinction between the neighboring countries when it comes to the question of interaction, unless some particular country (or geopolitical entity) functions as a Stackelberg leader. Therefore, except for the equations where we have explored the possibility of the existence of Stackelberg leader, we have taken equal weights. However, we have used a second weighting scheme to check the robustness of my baseline results. This second weighting scheme uses both geographical and GDP similarity and dissimilarity as factors in the weights (Liu and Martinez-Vazquez, 2014). The underlying logic is what runs under all spatial analysis – 'closer' entities are likely to compete more. These weights are created by multiplying the inverse of the geographical (air travel distance to capital or main airport) distance

between with the inverse of the absolute difference in per capita GDP. The baseline results do not qualitatively change at all with this alternative scheme, and hence in the estimations for the Stackelberg models we have used only equal uniform weights. The next section discusses the computation of the dependent variables and the different explanatory and control variables.

2.4. Data and Variables

The empirical specification used for this paper estimates a tax reaction function where the dependent variable is a measure of corporate tax rate. The two dependent variables that we have used in this analysis are the statutory tax rate (STR) and the effective average tax rate (EATR). Statutory tax rate is expected to affect where the MNCs declare profits. Through profit shifting and using transfer pricing MNCs declare profit where the statutory tax rate is the lowest. On the other hand, following Devereux and Griffith (1998, 2003) we argue that the policy variable that is important for the location decision for new investment decision is the EATR. Thus competition in terms of STR can be interpreted as competition over paper profit, while competition in terms of EATR can be interpreted as competition over location decision of new investment.

In large parts of the existing empirical literature (especially in the earlier literature) the so called 'backward looking' measures of average and marginal taxation on capital have been used due to lack of better measures[6]. However, investors and decision makers within firms can realistically be expected to consider expected future tax payments

[6]These backward looking measures are generally called the Average Effective Tax Rate (AETR) and Average Marginal Tax Rate (AMTR).

instead of some historical measure of tax payment (as measured by the backward looking tax measures AETR and AMTR) when deciding about new investment and location of new investment. EATR is such a forward looking measure of taxation. To some extent EATR can capture the various aspects of the tax system better than the simple statutory tax rate. However, at the same time we also note that for the governments it is the statutory tax rate on capital that is the most obvious and visible policy variable. The entire inspiration for the tax competition literature was (and still is) derived from the alleged interdependent changes in statutory tax rates across countries. Therefore inclusion of statutory tax rate in the analysis seems only natural.

By definition the Effective Average Tax Rate (EATR) measures the proportion of total income taken in tax from a hypothetical investment project. Thus this is defined as the scaled difference between the project's net present values (NPV) in the absence and in the presence of a tax. There are two choices for the scaling factor. The first is the net present value of the pre-tax total income stream, net of depreciation, and the second is the net present value of the economic rent (the NPV of the project in the absence of tax). Devereux and Griffith (2003) in their original paper prefer the former measure and here we have followed their approach. Klemm (2008) has also shown that EATR as defined by Devereux and Griffith (2003) pertains to a one period perturbation to the capital stock where the investment is sold in the second period. Klemm (2008) thus derives an expression of EATR for a permanent perturbation to the capital stock. This is the EATR measure that we have used as the dependent variable in my analysis and it is computed as follows. Let, δ denote the rate of depreciation, ρ the real financial return, r and i be the real and nominal rates of interest respectively, R* the NPV of the project when there is

no tax, and R is the NPV when there is tax at the rate z. Moreover, let ϕ be the rate at which capital expenditure can be offset against tax which is conditional on the type of capital employed. When the project is completely debt financed then, using the above notations we get[7],

$$EATR = \frac{R^* - R}{p/(r+\delta)}$$

Where,

$$R^* = (p - r)/(r + \delta)$$

and, assuming that the financing of the investment is done using retained earning only,

$$R = \frac{(p+\delta)(1+\pi)(1-z)}{\rho - \pi + \delta(1+\pi)} - 1 + A$$

where, A is the present discounted value of depreciation allowances multiplied by the tax rate (z). The calculation of A is contingent upon whether a country's tax system allows for straight-line depreciation or declining balance depreciation. In my sample we have both types of depreciation allowances. For the declining balance method A is calculated as,

$$A = z\phi \frac{1+\rho}{\rho+\phi}$$

while, for the straight line method it is,

$$A = z\phi \frac{(1+\rho)}{\rho}(1 - (\frac{1}{1+\rho})^{1/\rho})$$

[7] The other measure of EATR (the EATRR of Devereux and Griffith, 2003) would be $EATRR = \frac{R^* - R}{R^*}$, where the scaling factor is the NPV of the project in the absence of the tax. The EATRR remains the same whether we consider a one period or a permanent perturbation to the capital stock.

Derivation of the above compact expressions for R, R* and A involves several simplifying but commonly made assumptions in the literature. First we ignore any personal taxes. Second, we assume that the entire project is financed by retained earnings and is in plant and machinery.

Furthermore, we are making the following assumptions regarding the values of the parameters in the calculation of EATR. The economic depreciation rate is assumed to be 12.5 percent. In major part of the empirical literature the real rate of interest is generally assumed to be ten percent. However, we have calculated the applicable value of the real interest rate from the nominal interest rate and an assumed rate of inflation of 3.5 percent. The expected rate of economic profit is ten percent. With the above assumptions rate of financial return becomes equal to the nominal interest rate. The tax rates relevant for the above studies are collected from the KPMG's Corporate Tax Rate Survey (1993-2006), from the Corporate Tax Rate Tables from KPMG website and from the American Enterprise Institute's International Tax Database. The AEI tax data base also has information about the value of capital allowance and the applicable method (straight line vs. declining balance) for the countries. The value of *A* appropriate for each country for each year of our sample is calculated using these two pieces of information. The nominal interest rate data is collected from World Bank's World Development Indicator Database.

The control variables that we have included in the model follow the well-established prior research (Devereux, Lockwood, and Redoano, 2008; Altshuler and Goodspeed, 2014 etc.). All of these variables are entered with one period lag. These are government consumption expenditure as percentage of GDP, proportion of young (less than 14 years) and proportion of old (older than 65 years) people in the total population

as a percentage of working population (dependency ratio), population density, proportion of urban population and openness of the economy. The countries and geopolitical entities in our sample differ from each other widely. On the one hand we have resource rich countries like Indonesia and on the other we have Singapore and Hong Kong which have hardly any natural resource. According to Rogers (2002) these natural resource poor countries and entities have thrived due to their governments' policies of attracting businesses and capital by providing a preferential treatment for capital. Therefore to capture the effect of the availability of natural resources on tax interaction we have included the rent from natural resources earned by these countries as a percentage of their GDP as a new explanatory variable. The source of data is the World Bank's World Development Indicator database[8].

ASEAN currently includes ten countries - Brunei, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam. The South East Asia region has one more member country – East Timor. Other geo-political entities in this region are Macao and Hong Kong (two Special Administrative Regions of China) and Taiwan. Lack of availability of comparable and dependable data has limited our sample to Brunei, Hong Kong, Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam - for the nineteen year period 1993-2012. The following section discusses the results and findings of our analysis.

[8] Accessed during May, 2014, September 2014 and August 2015.

2.5. Results and Discussion

Tables 1 and 2 along with Figures 1 and 2 sets out a broad picture of what has happened to the Statutory Tax Rate (STR) and Effective Average Tax Rate (EATR) in our sample over the better part of last two decades. Table 1 gives the sample average rate, standard deviation and coefficient of variation for each year. Table 2 shows the average rate and percentage decline in both STR and EATR for each country separately along with their sample counterparts.

The average STR has declined more compared to the average EATR in our sample. This is not surprising given that EATR incorporates the effect of inflation rate along with the STR and reflects the changes in other policy variables (for example the allowance rate) and economic factors (lending interest rate or nominal interest rate). However, these reductions in either STR or EATR have not been without any reversal. During 2005-2007 STR and during 1999-2002 EATR showed some tendency of increase. As depicted later in Figure 1, the increasing tendency of STR was mainly driven by a temporary increase in STR by Philippines and Hong Kong. The increase in EATR, on the other hand, was due the rise in EATR (resulting from other macroeconomic variables) in almost all countries in our sample which was most likely the result of the 1997 financial crisis[9].

[9] To capture the effect of the 1997 South Asian Financial crisis I tried to test for a structural break during 1998-1999. However, using a simple dummy did not change the results. On the other hand a fully fledged test required testing for interaction of each explanatory variable with the time dummy (pre and post crisis) which was not possible due to the sample size. Moreover, the countries did not increase the statutory rates during or in the immediate aftermath of the crisis.

Table 2.1: Average, Standard Deviation (SD) and Coefficient of Variation (CV) of EATR and STR

Year	Average STR	SD of STR	CV of STR	average EATR	SD of EATR	CV of EATR
1993	31.06	6.78	21.84	27.40	6.20	22.62
1994	30.69	6.98	22.76	27.32	7.06	25.83
1995	29.19	5.81	19.89	25.33	5.79	22.84
1996	29.06	5.87	20.20	25.30	5.81	22.98
1997	29.06	5.87	20.20	25.24	6.16	24.39
1998	28.31	5.34	18.85	23.95	5.77	24.08
1999	28.13	5.36	19.05	25.49	5.89	23.13
2000	28.00	5.24	18.70	25.93	6.32	24.40
2001	27.94	5.27	18.85	26.42	5.26	19.90
2002	27.81	5.34	19.22	26.68	5.43	20.37
2003	27.69	5.20	18.79	26.70	5.34	20.01
2004	26.94	5.25	19.50	26.10	5.54	21.22
2005	26.94	5.25	19.50	25.71	6.13	23.84
2006	27.31	5.75	21.05	25.78	6.38	24.75
2007	27.19	5.74	21.13	25.96	6.33	24.40
2008	26.81	6.14	22.90	25.60	6.38	24.92
2009	24.75	5.07	20.49	24.01	5.39	22.45
2010	24.00	5.08	21.16	23.22	5.34	23.02
2011	23.81	5.13	21.53	22.86	5.37	23.48
2012	22.94	4.48	19.51	22.28	5.12	22.97

In our sample Hong Kong consistently has the lowest rate. Its rates are lower than that of even Singapore which is the lowest STR country in ASEAN. In this respect Hong Kong is like the Ireland of this region. Only in recent years have Hong Kong's EATR been converging to the Singapore rate. Vietnam had the highest rate (around 40%) in the region and is one of the three countries (other two being Singapore and Malaysia) which have reduced their tax rates regularly during our sample period. Although Vietnam had the highest STR, but its EATR has been much lower (and stayed stable) compared to

Indonesia which had the highest EATR at the beginning of our sample. Thailand and Brunei on the other hand kept their STR much more stable and resisted pressures from falling rates elsewhere (Singapore etc.) in the sample. The reduction in STR by Singapore, followed by Malaysia, Philippines and Vietnam has prompted some authors to conclude that there is evidence of partial tax competition in terms of STR in this region (Tohari & Retnawati, 2010, p. 56). Although there is some indication that some of the countries in our sample are converging towards a similar STR but the movement in EATR depicts a different story. In terms of EATR movement we do not see any clear pattern emerging other than slight indication of divergence. As we will see later, the policy that these countries are currently pursuing to attract capital and to maintain a stable tax revenue from corporate taxes involve more emphasis on negotiating and signing bilateral Double Tax Avoidance (both within and outside the region) and creating regulatory mechanisms for transfer pricing schemes adopted by MNCs. Moreover, the higher tax rates in larger countries like Indonesia, and much lower rates in Singapore and Hong Kong follows the prediction of size-asymmetric jurisdictions' tax interaction (Bucovetsky, 1991; Wilson, 1991).

Table 2.2: Reduction in Statutory Tax Rates

	Statutory Tax Rate		Effective Average Tax Rate	
	Average Rate (%)	% Reduction	Average Rate (%)	% Reduction
Brunei	28.65	26.67	29.25	25.08
Hong Kong	16.75	5.71	14.18	0.42
Indonesia	29.65	28.57	29.53	29.80
Malaysia	28.05	26.47	25.69	12.76
Philippines	32.95	14.29	30.34	0.60
Singapore	22.50	37.03	20.84	39.00
Thailand	29.65	23.33	26.21	12.47
Vietnam	30.85	37.50	26.84	21.49
Sample	**27.38**	**26.16**	**25.36**	**18.70**

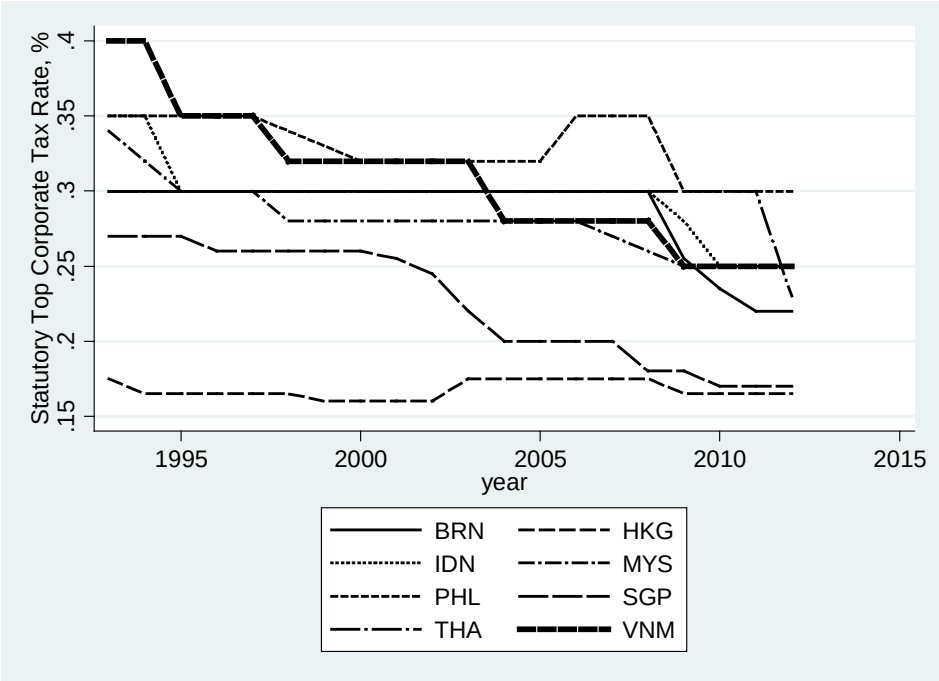

Figure 2.1: Movement of Statutory Tax Rate

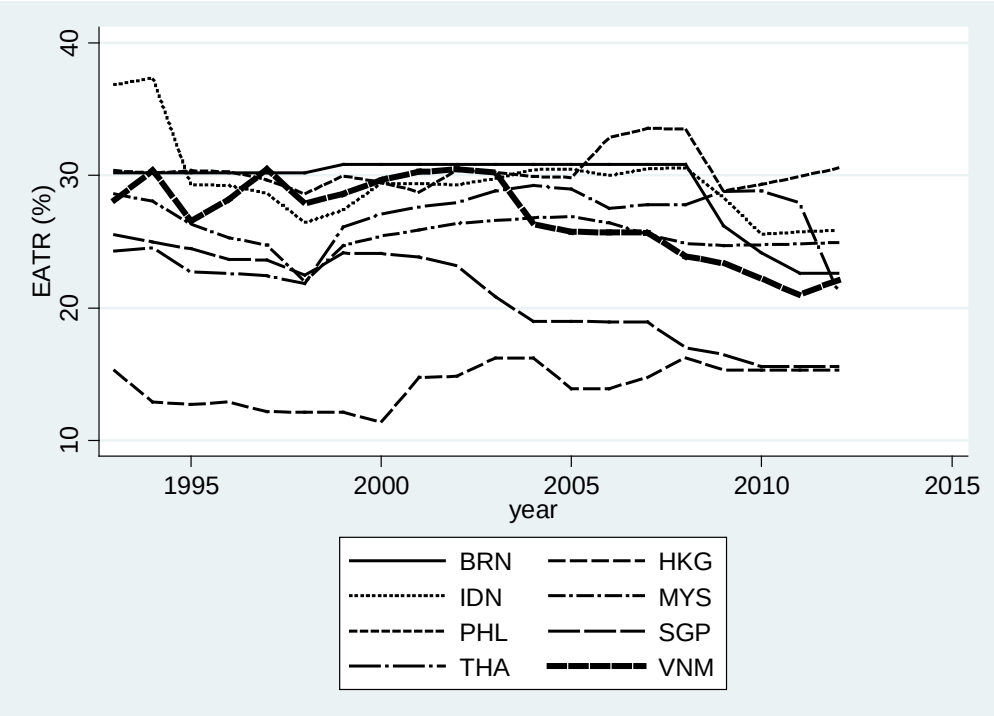

Figure 2.2: Movement of Effective Average Tax Rate (EATR)

The estimation results are presented in Table 3, 4A and 4B below. The dependent variable for each model is noted as the column heading for each model – either EATR or STR. In most of our models only the coefficients on the spatially lagged tax rate and own lagged tax rates are statistically significant[10]. Tables 3 reports results from the estimations where we assume that there is no Stackelberg leader present in our sample and tax setting takes place in a Nash game. The coefficient on openness variable is positive in all the specifications. This contradicts the results of research done using EU and OECD data. Relatively more open economies generally tend to have lower tax rates, but in our sample the result seems to be that more open jurisdictions have higher taxes –

[10] Similar results have been found by Suzuki (2013) in an unpublished paper using a slightly different dataset as well.

both EATR and STR. Jurisdictions with higher proportion of dependent population tend to have higher expenditure needs, and hence higher tax rates. As expected public expenditure has a positive coefficient as well. Finally own lagged interest rate is always large and statistically significant. This was expected as tax policy always shows a remarkable level of time consistency.

Table 2.3: Estimations Results for Nash Interaction, Equal Weights

	Effective Average Tax Rate		Statutory Tax Rate	
	(1A)	(1B)	(2A)	(2A)
VARIABLES	EATR	EATR	STR	STR
Spatially Lagged Tax Rate	0.409**	0.404*	0.300	0.300
	(0.173)	(0.188)	(0.221)	(0.208)
Own Lagged Tax Rate	0.533***	0.534***	0.526***	0.526***
	(0.128)	(0.124)	(0.0916)	(0.0777)
Dependency Ratio	0.0699	0.0672	0.0606	0.0606
	(0.103)	(0.0869)	(0.0587)	(0.0515)
Population Density	0.0136	0.0197	-0.0191	-0.0191
	(0.0633)	(0.0552)	(0.0666)	(0.0306)
Urban Population	0.0646	0.0646	0.0459	0.0459
	(0.0883)	(0.0880)	(0.0627)	(0.0632)
Government Expenditure	0.0106	0.0113	0.00169	0.00169
	(0.0165)	(0.0212)	(0.0154)	(0.0167)
Openness	0.0100	0.0103	0.00519	0.00519
	(0.0151)	(0.0174)	(0.0126)	(0.0121)
Per Capita Real GDP	-0.00750	-0.00700	0.000416	0.000413
	(0.0463)	(0.0453)	(0.0266)	(0.0258)
Rent from Natural Resources	0.000386	0.000388	0.000707***	0.000707***
	(0.000263)	(0.000265)	(0.000127)	(0.000127)
Time Trend	Yes	No	Yes	No
Country Fixed Effects	Yes	Yes	Yes	Yes
Observations	144	144	144	144
Number of Countries	8	8	8	8
First Stage F Stats	24.23[a]	38.15[b]	60.11[a]	30.90[b]
AR(1) (p-value)	0.0205	0.0196	0.0329	0.0482
AR(2) (p-value)	0.187	0.191	0.912	0.912

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

[a]: DF = (10,8), [b]: DF = (9,8)

The estimated coefficient on the Spatial Lag variable is of primary importance here. For EATR, the estimated coefficient of this variable is positive and statistically significant. Borrowing the Devereaux, Griffith, and Redoano (2008) interpretation, (Model 1A, table 3) this result implies that a one percentage point expected increase in the 'average' tax rate of other jurisdictions in the region results in a 0.41 percentage point increase in EATR of each jurisdiction. This result is robust to the introduction or omission of a time trend (models 1B and 2B). Thus there is some evidence that the jurisdictions in our sample respond strategically to each other's effective tax rate to attract new investment. However, the coefficient on neighbor's STR although is positive, but is not statistically significant. Only if we exclude the variable 'rent from natural resources' from the set of explanatory variables that this coefficient becomes significant. The (positive) coefficient on the rent from natural resources is statistically significant in determining the statutory tax rate but is not a significant determining factor for EATR. This implies that in our sample countries with higher rents from natural resources can maintain higher tax rates. On the one hand natural resources in those countries tend to attract capital in spite of higher taxes. On the other, the lost potential revenue from newer corporate tax bases is not felt due to the cushioning effect of these rents. If we are willing to model the interaction as a Nash Game then our data gives evidence that effective average tax rates are "strategic complements" while on an average statutory tax rates are determined by the historical pattern of own taxes and other conditions of the specific country in question.

However, the Nash interaction is just an *a prioi* assumption imposed on the unknown interaction across jurisdictions. In tables 4A and 4B, we have presented the

results of the estimations in search of a Stackelberg leader in this region. Here I have tested the possibility of each jurisdiction acting as the Stackelberg leader. The alleged leader country's tax rate is excluded from the calculation of the Spatially Lagged Tax Variable, and one period temporally lagged tax variable of the leader is included in each model. This gives us a total of sixteen models (eight jurisdictions and two different tax measures for each jurisdiction). In most of the models own tax rate (lagged) is still large and positive. The spatial lag variable is still positive although not always statistically significant. Thus the tax interaction is still present among the remaining seven countries in each model.

Table 2.4: Estimation Results for Stackelberg Leader

Leader Country Considered	BRN	BRN	HKG	HKG	IDN	IDN	MYS	MYS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	EATR	STR	EATR	STR	EATR	STR	EATR	STR
Spatially Lagged Tax Rate	0.129	0.0367	0.357**	0.0363	0.332**	-0.0171	0.459**	0.231
	(0.202)	(0.368)	(0.119)	(0.201)	(0.100)	(0.237)	(0.174)	(0.287)
Leader's Lagged Tax Rate	0.0664	0.116	-0.114	0.128	-0.157***	-0.0692	-0.205	0.00987
	(0.145)	(0.155)	(0.0935)	(0.196)	(0.0367)	(0.0591)	(0.154)	(0.232)
Own Lagged Tax Rate	0.553***	0.157	0.676***	0.302*	0.782***	0.429**	0.625***	0.241
	(0.0721)	(0.129)	(0.0882)	(0.139)	(0.105)	(0.133)	(0.139)	(0.144)
Dependency Ratio	0.0129	0.0870	-0.0109	0.0626	-0.129	-0.0228	0.116	0.190**
	(0.0777)	(0.0877)	(0.0454)	(0.0562)	(0.148)	(0.122)	(0.0918)	(0.0798)
Population Density	0.00907	-0.166	0.0400	-0.00874	-0.0189	-0.0708	-0.0845	-0.163
	(0.0533)	(0.0958)	(0.0651)	(0.132)	(0.0898)	(0.0720)	(0.0722)	(0.103)
Urban Population	0.0160	0.0155	0.0956**	0.131***	-0.0858	-0.0897	0.0339	0.0371
	(0.0815)	(0.0846)	(0.0326)	(0.0359)	(0.101)	(0.113)	(0.0597)	(0.0851)
Government Expenditure	0.00142	-0.00526	-0.00366	-0.0176	-0.00764	0.00452	0.00165	0.00121
	(0.0187)	(0.0134)	(0.0156)	(0.0173)	(0.0103)	(0.0114)	(0.0160)	(0.0152)
Openness	0.00596	-0.00985	-0.00388	-0.00299	-0.00908	-0.00879	0.00329	0.00869
	(0.00892)	(0.0127)	(0.0162)	(0.0200)	(0.0115)	(0.0147)	(0.0122)	(0.0161)
Per Capita Real GDP	-0.0917**	-0.0607	-0.0172	-0.0278	-0.00217	-0.00907	0.00590	-0.0191
	(0.0267)	(0.0321)	(0.0443)	(0.0354)	(0.0449)	(0.0227)	(0.0308)	(0.0257)
Rent from Natural Resources	9.11e-05	0.00127*	0.000211	0.00111**	0.000356	0.0011***	0.00052**	0.0012***
	(0.000807)	(0.000590)	(0.000238)	(0.000377)	(0.000189)	(0.00023)	(0.000194)	(0.000112)
Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	126	126	126	126	126	126	126	126
Number of countries	7	7	7	7	7	7	7	7
First Stage F Stats (11,7)	92.38	6.869	29.36	23.95	39.69	43.22	5.251	16.09
AR(1) (p-value)	0.0241	0.160	0.0261	0.0336	0.0134	0.0296	0.0189	0.0766
AR(2) (p-value)	0.191	0.338	0.198	0.300	0.716	0.989	0.136	0.784

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.5: Estimation Results for Stackelberg Leader

Leader Country Considered	PHL	PHL	SGP	SGP	THA	THA	VNM	VNM
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
VARIABLES	EATR	STR	EATR	STR	EATR	STR	EATR	STR
Spatially Lagged Tax Rate	0.233	-0.112	0.404**	0.499***	0.503**	0.333	0.250	0.230
	(0.196)	(0.350)	(0.158)	(0.135)	(0.175)	(0.247)	(0.171)	(0.309)
Leader's Lagged Tax Rate	-0.00456	0.154**	0.223	0.0989	-0.0262		0.00976	-0.188**
	(0.0843)	(0.0618)	(0.184)	(0.156)	(0.0468)		(0.121)	(0.0664)
Own Lagged Tax Rate	0.577***	0.227*	0.463***	0.118	0.475***	0.212*	0.635***	0.375**
	(0.0819)	(0.102)	(0.109)	(0.103)	(0.0419)	(0.106)	(0.113)	(0.128)
Dependency Ratio	0.0573	0.0873	0.0336	0.0369	0.122	0.130	0.0398	0.0615
	(0.0929)	(0.0815)	(0.0743)	(0.0524)	(0.107)	(0.0882)	(0.0795)	(0.0745)
Population Density	-0.0248	-0.117	-0.0352	-0.220	0.0434	-0.121	0.0397	-0.0684
	(0.0595)	(0.0847)	(0.0581)	(0.132)	(0.149)	(0.152)	(0.0623)	(0.0675)
Urban Population	0.0571	0.0296	-0.0405	-0.0298	0.0420	0.0321	0.0522	0.0418
	(0.0578)	(0.0635)	(0.0581)	(0.0783)	(0.107)	(0.0855)	(0.0721)	(0.0619)
Government Expenditure	0.0279	0.0243**	0.0122	-0.00576	0.0114	0.00490	0.0194	-0.00191
	(0.0154)	(0.00954)	(0.00823)	(0.0187)	(0.0189)	(0.0140)	(0.0140)	(0.0155)
Openness	0.0317**	0.0157	0.00730	-0.00781	-0.00551	-0.00430	0.0131	0.00328
	(0.0107)	(0.0190)	(0.0102)	(0.0184)	(0.0165)	(0.0190)	(0.0115)	(0.0119)
Per Capita Real GDP	-0.0379	-0.0472	0.00537	-0.0215	0.0203	-0.0162	0.00670	0.0149
	(0.0338)	(0.0286)	(0.0465)	(0.0462)	(0.0371)	(0.0292)	(0.0452)	(0.0195)
Rent from Natural Resources	0.000525	0.0012**	0.000406	0.0011***	0.000439	0.00108***	0.000444	0.000836***
	(0.000373)	(0.00021)	(0.000271)	(0.000269)	(0.000322)	(0.000242)	(0.000238)	(0.000217)
Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	126	126	126	126	126	126	126	126
Number of countries	7	7	7	7	7	7	7	7
First Stage F Stats (11,7)	22.90	14.37	12.58	5.325	53.33	65.04	102.2	9.029
AR(1) (p-value)	0.0389	0.0558	0.0182	0.0894	0.0249	0.0687	0.0239	0.0841
AR(2) (p-value)	0.171	0.0700	0.152	0.700	0.188	0.879	0.467	0.846

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The estimated coefficient on the 'leader's' rate is statistically significant only in case of Indonesia, Viet Nam and Philippines. However, the sign of the coefficient is negative for Indonesia and Viet Nam. The magnitude of the coefficient is small. For other countries the coefficients do not support any general conclusion. Thus in our sample it appears that Indonesia and Viet Nam's tax rate changes elicit opposite reaction from the other countries in the block. While for Philippines the reaction is in the same direction. These results imply that there is most likely no Stackelberg leader when it comes to the issue of setting corporate taxes – either STR or EATR. Given the general pattern of the movement of STR and EATR in this region (as shown earlier in Figures 1 and 2) this result does not surprise us. There was no obvious 'leader' in the setting of the taxes – either STR or EATR. Singapore and Hong Kong maintained the lowest rates, but others hardly followed suit.

Countries in South East Asia vary widely in their level of development, availability of natural resources, size and national needs. As a result the economic policies in each country differ from the others in order to deal with country specific needs. On the one hand we have countries and administrative regions like Singapore and Hong Kong which do not have many natural resources and therefore use much lower tax rates than the other countries to attract capital (Rogers, 2002; Chia and Whalley, 1995). On the other, we have countries with natural resources with relatively higher tax rates compared to others. Singapore not only has a lower tax rate than others in our sample (except Hong Kong) but from 1950s it has also used other preferential policies to attract 'Pioneering Industries'. For example Singapore offers a ten year tax holiday. The activities of Singapore and Hong Kong may not have exercised enough pressure on the neighboring countries to

lower their rates, but may have pressured them to follow suit in providing other types of incentives to attract capital. For example Philippines and Thailand provides eight years of tax holiday, Vietnam provides five years, while Indonesia provides two years (Suzuki, 2013). At the same time Singapore and Vietnam, two countries which have reduced their corporate tax rates the most have also implemented or increased their indirect taxes – VAT and GST. Thus the countries which have lowered their taxes on capital have (following the prediction of the classic tax competition theory) increased the tax burden on the less mobile factors. Thus it may be wrong to say that there is no policy competition or interaction at all across this region because there is not much evidence to support the conclusion of explicit tax competition.

At the same time we also note that the South East Asian countries attract capital as a whole. MNCs tend to establish their manufacturing partially in several of these countries. This is the reason of very high intra-industry trade among these countries compared to other countries (Kuroda, 2002). The establishment of ASEAN has increased the trade in finished good with the rest of the world while the trade among these countries remains predominantly governed by intermediate and semi-finished products (Sharma & Chua, 2000 and Cortinhas, 2007). Such intra-industry trade indicates strong agglomeration forces. In the presence of agglomeration forces the countries of South East Asia which have large domestic markets are not yet faced with the prospect where they must reduce taxes too drastically in response to each other's policy to lure capital (Haufler and Wooton, 1999; Baldwin and Krugman, 2004). Rather it is quite plausible that countries in our sample are not competing among themselves to attract capital either from the rest of the world or from each other. These countries as a whole are attracting

capital from the rest of the world. Cheap labor and less stringent regulatory policies in many of these countries are working as the main capital magnets for the entire region.

Our conjecture that these countries are not too strongly competing amongst themselves to lure capital away from each other gets further support when we recognize that in last few years the main policy thrust of these countries have been concluding Double Tax Avoidance Treaties and bolstering their transfer pricing related regulations. Double taxation results in capital flight from both countries (where the capital was being taxed) to a third country. To address double taxation countries can either provide unilateral relief under its own tax law, or through bilateral tax treaty. Countries in the South East Asian region have vigorously pursued the bilateral treaty path – both with countries with in the region and outside the region. By 2006, Singapore, Indonesia and Vietnam had the most extensive and modern bilateral treaty network in this region (Farrow & Sunita, 2006). As the following table (Table 5) shows other countries have also followed suit in recent years.

Table 2.6: Year of signing/coming into effect of Double Tax Avoidance Treaties

	Brunei	Hong Kong	Indon-esia	Malay-sia	Philipp-ines	Singa-pore	Thail-and	Vietnam
Brunei								
Hong Kong	2011							
Indon-esia	2002	2013						
Malay-sia	2010	2013	1991					
Philipp-ines			1993	1982				
Singa-pore	2005		1990	2004	1977			
Thail-and		2006	2004	1982	1982	1975		
Vietnam	2009	2010	1997	1995	2001	1994	1992	

Source: Ministry of Finance websites of the above countries.

2.6. Conclusion

This paper tries to answer two questions about tax interaction in the sample of jurisdictions we studied. First, is there evidence of strategic tax interaction among these jurisdictions? Second, if there is evidence of interaction then is there any evidence of the existence of a Stackelberg leader within such tax interaction?

To answer the first question we estimated the tax reaction function as a Spatially Lagged Dynamic models assuming a Nash setting. In both our specifications we find that there is some evidence that the jurisdictions behave in such a way that Effect Average Tax Rate seems to be strategic complements while Statutory Tax Rate is not. To answer the second question we estimated the models treating each country as the Stackelberg leader separately. Interestingly there is not much support of the existence of any Stackelberg leader in our sample.

These results have important and interesting policy implications. We have found that although there is some evidence that the jurisdictions interact strategically in terms of Effective Average Tax Rate but not in terms of Statutory Tax Rate. Moreover, the Effective Average Tax Rates have not declined but rather gone up in recent years. Some of the countries in our sample do provide strong incentives to capital through other measures like tax holidays and double tax avoidance treaties. In addition, these countries and regions are strengthening their transfer pricing regulatory mechanisms. At the same time there is the observed pattern of slowly but gradually declining tax rates most of the jurisdictions. This reduction in the statutory tax rates appears to be more a result of the ongoing tax reform policies than tax competition. The competition for capital most certainly happens in terms of incentives provided to capital in forms other than tax rates. Having cheap labor (relative to the rest of the world) and enjoying the benefits of agglomeration rents (as part of members of the region as a whole), most of these countries are not yet faced with the prospect of capital flight and hence not yet showing signs of aggressive tax competition. However, in future the possibility of such competition cannot be ruled out if other regions of the world start luring away the capital from these countries. More coordination and harmonization might be necessary as and when such scenarios come to fruition.

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Chapter 3: Essay 2 – In Search of a Soft Budget Constraint in Indian State Finances

3.1. Introduction

Janos Kornai (1979, 1980, and 1986) introduced the idea of Soft budget constraint (SBC henceforth) in the context of the public sector enterprises in the centrally planned economies of that time. According to Kornai, when the organization or enterprise behave inefficiently and financially irresponsibly due to having the knowledge (or expectation) that a higher level government or authority (or the creditors) will bail it out in case of financial trouble resulting from its own financial mismanagement then we can say that the organization faces a Soft Budget Constraint. The existence of SBC distorts the incentive structure for subsidiary organizations to manage its finances prudently. The canonical model of SBC in the literature (Dewatripont and Maskin, 1995) argues that the inability of politicians and policy makers to commit *ex ante* to a *no-bailout* policy is the main reason behind the existence and persistence of SBC. Following Kornai the early literature looked at the behavior of public sector enterprises and in some cases large private corporations (and banks) to study the nature and existence of SBC (Maskin, 1999). McKinnon and Nechyba (1997) and then Quian and Roland (1998) first pointed out that even the fiscal behavior of lower levels of governments in a fiscal federation can be symptomatic of the existence of SBC. Subsequent literature has come to recognize that the existence of SBC can create sever problems for the fiscal viability of federations and more generally of decentralized systems, and in many federations SBC is endemic (Rodden, Eskelund and Litvack, 2003).

Wildasin (1997) noted that the sub-national governments (state and local) in advanced industrialized countries face economic hardship from time to time (for example, New York in the 1970s, Philadelphia and Pennsylvania in the 1990s, German Landers). The higher levels of government intervene in such situations and give rise to the expectations of SBC for other similar lower levels of governments. However, the extent of SBC in developed countries generally tend to be limited by the severity of the 'conditions' of such *bail out* such as firing and furloughing of employees, forced spending cuts etc. which can be seen as punishments for the fiscal mismanagement of the lower governmental units. Developing and transitional countries on the other hand although have to rescue the lower level units with funds and resources, but they do not and cannot generally impose such strict punishment on the lower units. This type of behavior on part of the higher level government makes the budget constraint faced by the lower level units soft and nonbinding. More generally, the problem of SBC can be interpreted as another manifestation of the problem of the mismanaged commons (Rodden, Eskelund and Litvack, 2003). The transfers for bailouts from the central government are drawn from the common revenue pool while the overspending only benefits the constituents of the local/regional government getting the bailout. The local residents are benefiting at the cost of the other residents of the country and this is operationalized by the fiscally imprudent behavior of the local/regional government.

The questions that have been dogging researchers in this area are generally threefold. Why and how do SBC exist? How to identify the existence of SBC in a particular country? How to solve the problem? The relative scarcity of empirical studies on Soft Budget Constraint reflects the difficulty of measuring this concept. SBC entails

the "expectations" of regional governments and their “behavior” resulting from that expectation. Most authors look at fiscal data of regional governments for signs of persistent mismatch between total regional revenue (including regular central transfers) and expenditures undertaken by them. There have been relatively few studies which try to uncover the existence of SBC through analyzing the interaction across sub-national governments[11]. It has long been alleged (see for example McCarten, 2003 for a summary) that Indian sub-national finances suffer from SBC. In this essay we have attempted to test the existence of this SBC in the state budgets of Indian Union.

3.2. Literature Review

The creation of a federation is like a many party contract. It is a contract between the national and sub-national governments. It is also a contract between the citizens and different levels of governments. In the contract between the national and sub-national government the behavior and actions of the two governments resemble a sequential game (Wildasin, 1997; Inman, 2003; Goodspeed, 2002). By studying the first stage actions, announcements and policies of the central government, the regional government tries to assess credibility of a no bailout (for mismanaged subnational units) policy. Then the subnational government decides to spend either within means or overspend. If it overspends then the central government has to choose either to stick to its policy or to provide bailout. However, the existence of SBC in practice implies that the credibility of the no bailout policy suffers from the time inconsistency problem (Goodspeed, 2002). According to Wildasin (1997) the ultimate decision of providing or not providing bailouts

[11] An unpublished working paper by Petterson-Lindbom and Dahlberg (2003) is a notable exception.

to local governments depends on the extent of externalities created by the provision (or no provision) of the local public goods under the jurisdiction of the profligate sub-national unit. In his model the central government's objective is to maximize the welfare of all the citizens of the country (following the classical literature on public goods provision and fiscal federalism) through the provision of national public goods and also by ensuring some provision of local public goods. The local public goods provided by the local and regional governments not only benefit the local residents but there are some externalities spilling over to other jurisdictions as well. When a failing local government decides (or is completely unable) to limit the provision of this public good the residents of other local jurisdictions also suffer. So the central government has to decide whether to limit the provision of the national public good and subsidize the provision of the local public good that has been partially or fully discontinued by the local unit. If the cost to the citizens of a reduction in the national public good is mitigated by the positive externalities arising from the restoration of the supply of the local public good in the jurisdiction of the mismanaged local government, the central government decides to provide the bailout. Wildasin further asserts that this is more likely to be the case for larger sub-national units rather than smaller sub-national units. Thus larger sub-national governments are more likely to operate under the belief that the budget constraint is not a hard constraint. In effect what Wildasin is arguing is basically a variant of the "too big to (let it) fail" argument which we have heard for several banks and financial institutions during the recent recession. Practical experience however does not fully support Wildasin's hypothesis. Not only large, but we have seen smaller jurisdictions too get

bailouts. Examples range from Germany, Argentina, and Colombia to Brazil (Hagen, 2000).

Goodspeed (2002) analyzed the problem of SBC in a political economy game theoretic model. His model differs from Wildasin's model in three important ways. First in the framing of the objective function of the central government, in assuming away any externality from regional and local public goods, and finally by making the local governments Stackelberg Leaders[12] in this two periods sequential game. For Goodspeed the objective of the central government is re-election and citizens' votes depend on the supply "public goods" as a whole. Here the citizens have no way to distinguish between local or central public goods and so their unhappiness results in lower votes for the national government. In such a model it is shown that when people's voting behaviors in favor of the incumbent central government is more responsive to the increases in the quantity of public goods at low utility levels (i.e. at low starting public goods levels), it is in the self-interest of the central government to grant bailouts to profligate local governments (in the second period) so that they do not reduce local public goods. Here the local government knows that central government's no bailout policy is time inconsistent. The central government thus suffers from what has come to be known as the commitment problem - the central government cannot commit to a hard budget constraint. The local governments are aware of this problem and this leads to two consequences. First, the profligate regions borrow more under SBC in the first period than it would under Hard Budget Constraint as it knows less local public consumption

[12] In this formulation, higher level government does not announce any policy as a first stage action. Rather it is the local/sub-national governments which first decides whether to spend prudently or not.

has to be earmarked for servicing the debt. Second, the local region's tax burden increases only by a fraction of the borrowing as the rest is transferred to other parts of the nation (especially when bailouts are given to only the profligate region while taxes are raised across the nation). A corollary of this analysis is that regions where the incumbent government does not enjoy much support to start with will enjoy more bailouts than regions where they are already strong. But note that Robinson and Torvik (2009), however, reached theoretical results where bailouts are used by the incumbent government to "reward" their supporters more relative to the detractors. In their model the political party which constitutes the incumbent government at the center tries to consolidate its power and hold over those areas where it is already strong. Moreover, federal governments in developing countries are generally reluctant to 'punish' ordinary citizens many of whom are poor and depend crucially on the government services, for the fiscal mismanagement of the state and local governments – sometimes out of goodwill and ethical principles and sometimes to avert political suicide.

The existence of SBC eventually leads the central governments to fund more of regional and local expenditures than it intended and it leads the regional and local governments to overspend. It is however useful to note at the outset that bailouts – large one time transfers from the center to the local or regional governments are not necessarily symptomatic of the existence of SBC. Such transfers may actually be for helping out a sub-national unit in genuine fiscal trouble where it landed due to macroeconomic conditions in general and for no faults of its own. On the other hand, instead of a onetime transfer the center may choose to infuse relatively smaller transfers over the entire fiscal

year or allow special purpose grants which are much difficult to identify than lump sum bailouts. SBC is a "belief" on part of the sub-national units. Resource transfers from the center which stands to fund overspendings of the sub-national units – whether in the form of lump sum grants or continuous infusion of funds – only strengthens this belief. As Rodden et al. (2003) correctly recognizes, there does not exist a simple identifier of SBC. Sometimes SBC is outwardly obvious from the constitutional mandates and court rulings (as in the case of Germany) and sometimes it is the intangible manifestation of expectations.

There have been several studies on the determinants of expenditure and deficits in state finances in India (Chaudhuri and Dasgupta, 2006; Dutta, 1997; Khemani, 2002; Khemani, 2004, Keefer and Khemani, 2009, Dash and Raja, 2013). These studies consider economic or political variables as the factors influencing the pattern of expenditures and deficits. We have argued that SBC is more of a 'belief' on part of the state governments about getting fiscal bailouts. Such beliefs are built up on one's own past experience and experience of others. Interestingly none of these studies look for any pattern of interaction across the states. In this paper we attempt to fill this void, and argue that the existence of SBC in Indian state finances can only be clearly deciphered if we account for these strategic interactions across states. The next section explains the nature of state finances and how these interactions are likely to take place. The following section builds up the empirical model for investigating the existence of SBC in Indian state finances.

3.3. Issues of Fiscal Discipline in Indian State Finances

India is a *de facto* federal country with a quasi-federal Constitution. Unlike the USA, the Constitution grants more power to the national government compared to the states. The consequence of the quasi-federal and quasi-unitary constitution is that most of the effective taxing powers are concentrated at the central government or Government of India (GOI) (Bahl, Heredia-Ortiz, Martinez-Vazquez and Rider, 2005a). Having a strong central government and a quasi-unitary constitution was imperative at the time of independence. But this has led to a situation where fiscal accountability of state governments has not been clearly defined. The GOI has constitutional powers to intervene in state affairs and issue directives to the state governments. Although the states incur a large share of social and economic expenditures they are constitutionally handicapped in the matter of tax sources. However, it is also true that the states have not yet shown enough willingness or ability to broaden the tax bases allocated to them in an efficient manner (ibid, p.1).

The central government finances more than half of the state's financial requirements through central transfers or through debt financing. It is true that this generalization sweeps over tremendous disparity in performances of the States and over different periods (McCarten, 2003; Khemani, 2004). However, the composition of the state expenditure (wages, pensions and interest payments) hardly gives the states any maneuverability (Bahl et. al., 2005a) due to their contractually fixed nature. For the first four decades after independence India tried a modified planned economy model under the

exegesis of the extra-constitutional Central Planning Commission[13]. The policy tool used by the Planning Commission was the allocation of funds through the Plan transfers of which grants and loans had a 30:70 mix[14]. At the same time specific transfers were channelized through the Centrally Sponsored Schemes (CSS) under the line ministries. GOI used the central funds (allocated through matching and conditional block grants) to influence the expenditure patterns of the States. For the most part, States were viewed not as semi-autonomous jurisdictions but rather agencies of the central government for the implementation of centrally designed development projects some of which encroached into areas reserved for the states alone by the Constitution. This bred a culture of overspending and low reliance on own resources by the States. In 1991 the economy of India was liberalized, the license raj system of central control was more or less abolished. With this liberalization, the central control over state finances was relaxed, at least on paper.

As noted earlier the disparity of tax sources between GOI and the state governments is entrenched in the Constitution of India. The central government enjoys relatively more buoyant sources of revenue and therefore within the federal system four channels have been devised to transfer funds from the center to the states[15]. These are the Finance Commission Transfers, Planning Commission Transfers (as noted earlier), Conditional Matching Grants and Loans from the center[16]. Due to the political nature of

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[13] This has recently been scrapped and substituted by another extra constitutional body called the Niti Ayog (Policy Commission). However, right now rather than making five year plans the role of this policy making body is more advisory in nature.
[14] This is known as the Gadgil formula.
[15] Excellent detailed analysis of the inter-governmental transfer system in India can be found in Rao and Singh (2001a, 2001b).
[16] The Finance Commission (FC) is a statutory/constitutional body convened to determine some of the center to state transfers. Each FC generally works for two years and submits its

some of these fund transfer channels the state governments may find themselves facing a soft budget constraint (SBC). McCarten (2003) has a detailed discussion of the institutional structure of Indian federal system which points towards an environment where SBC is highly likely to exist. Even Bahl et. al. (2005a) points in the same direction. Planning Commission grants are subject to negotiations between the individual states and the Planning Commission (which is an extra-constitutional political body the members of which are from both the central and state legislatures) on a bipartite platform. Others have already commented that the outcomes of these negotiations are always politically determined (Weingast, Shepsle, and Johnsen, 1981; Baron and Ferejohn, 1989). It is also found that states run by the same political party (or coalition) as the central government enjoys bigger Plan transfers compared to others (or can at least expect to receive such larger grants or loans)[17] while the contrary is generally true for Finance Commission (FC) transfers which are generally based on formula devised by each FC. However, the FC transfers formula takes into account the current spending level of the states to determine and forecast future needs. It has been alleged that as a result of such emphasis on current spending in the FC formula States strategically overspend in the budget years just preceding the creation of a new Finance Commission to influence its own share in Finance Commission Transfers (Gurumurthi, 1996). As noted above, Planning Commission transfers (which are mixtures of grants and loans) are subject to political negotiations and this contributes towards softening the budget constraint facing the states. Bahl et al (2005a) argue that the loan-grant mix of the Planning Commission

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report to the central government (GoI). The transfers (FC transfers) for the next five years (called the Implementation Period for the just dissolved FC) is then determined by the recommendations of this report. Towards the end of this Implementation Period the next FC is convened.

[17] See for example Khemani (2002, 2003).

transfers encourages states to incur debt financing of projects (to get the grant part of the transfer which is 30%). States run by the same party as the center will hold more power in these negotiations and hence will not be afraid to run up deficits (as noted earlier, Khemani, 2002 and 2003 have found evidence in this regard). Goodspeed (2002) argues that regional governments run by the opposition (or other regional parties) will enjoy more bailouts because the federal/national government wants to gather more support in regions where it is politically weak (opposition led states).

The existence of SBC should manifest itself not only in but in several related facets of state finances. It is one of the strategic behaviors of the state governments. Along with the strategic behavior of states in Planning Commission negotiations and prior to Finance Commission's establishment (once every five years), states also consider the behavior and experience of other states when deciding whether to be in deficit or not. As we noted earlier, this 'learning' from the behavior and experience of other states is a crucial identifying feature of SBC. However, taken out of the context of strategic behavior this 'learning' can also be interpreted as an evidence of yardstick competition or policy diffusion. That is why it is very important to look at this 'learning' across states (as manifested in interaction across them) jointly with their other strategic behaviors. Therefore, in this essay I attempt to explore the reaction of the states to the formation of FCs, the political affinity with the government at the Center and each others' deficits when the spatial interaction across states is accounted for. In particular I want to test the following hypotheses:

Research Hypothesis 1: The accumulation of deficit by a state is influenced by the accumulation of deficit of its 'neighbor' states. In other words, if a state sees its 'neighbors' are accumulating debt then it also feels comfortable in incurring/increasing its deficits.

Research Hypothesis 2: Since the year preceding the constitution of the Finance Commission is taken as the base year by the Finance Commission for its calculations, therefore, the states try to show their bad fiscal conditions by running up relatively more deficits in these years. The Null Hypothesis is that establishment of Finance Commission does not elicit any strategic response from the states.

Hypothesis 3: Political affinity between the state and central governments (same party government at the center and the state) encourages the state to incur higher deficits (in expectation of Planning Commission and other Grants and Loans).

3.4. Econometric Specification

3.4.1. The Model

Conceptually the issue of SBC can be modeled as a simultaneous equation model when there is explicit default by the state (or lower level authorities) and bailouts by higher level governments. One equation describes the behavior of the central government while the other describes that of the state governments. To identify the parameters we need instrumental variables which can be included in one of the models and excluded from the other. In this regard, Petterson-Lindbom and Dahlberg (2003) uses a modified version of this strategy in their attempt to link the state government's fiscal behavior to its expectation of being rescued from financial troubles.

However, explicit default by state governments and bailout by the central government has not happened till now for any of the states of India (although for sub-state level authorities like State Electricity Boards, Cooperative Banks and Nationalized Commercial Banks default and bailouts have taken place). What we can observe in Indian State Finances is the persistence of deficits in the State Budgets. It is important to note here SBC arises because the higher level government fails (either intentionally or due to political compulsions) to stick to a market discipline policy *ex post*. Therefore our primary argument is that if one state sees that its neighboring states[18] are incurring deficits without being penalized in any way by the Central Government (without any reduction in central grants and loans and other transfers) then it also incurs deficits without much ado. This spatial interaction of the surplus or deficits is the outward manifestation of SBC in the state fiscal environment in India. The econometric models that we have used in this paper try to capture this spatial relationship across states.

In particular, the state fiscal behavior is modeled as a spatial autoregressive equation,

$$B_{it} = \gamma B_{it-1} + \rho \sum_{j \neq i} w_i B_{jt} + X_{it}\alpha_x + f_i + h_t + u_{it} \ldots\ldots (1)$$

Where B_{it} is the observed measure of fiscal behavior (surplus or deficit) of state *i* in period *t*. The own lagged fiscal measures is included in the model to account for the persistence of fiscal policy. The $\sum_{j \neq i} w_i B_{jt}$ term is the spatially weighted surplus or deficit of the 'neighboring' states and X_i are a set of state characteristic variables. We have used both (separately) lagged and contemporaneous values of B_{jt} to calculate this term. Finally, f_i and h_t are individual fixed effect and a time trend, respectively. The

[18]The concept of 'neighbor' is defined later.

individual effect captures the unobserved state characteristics that do not vary over time but affect the fiscal decisions of the state government. We would like to incorporate time fixed effects to control for variables that might have a common effect on the all the states in a given year, such as business cycle conditions. However, as noted by Devereux et al. (2008) in a spatial autoregressive model we cannot estimate the effect of time dummies separately from the effect of the spatially lagged variable.

The most important aspect of the above model is that it incorporates the weighted average of neighbor's fiscal behavior as an explanatory variable. Once we have accounted for the time persistence of fiscal variables (through the inclusion of the B_{it-1} term) and the economic characteristics of the jurisdiction that might affect its fiscal policy, the inclusion of this spatially lagged variable in the model is to account for the effects that the behavior of the neighboring jurisdictions have on each individual jurisdiction. When states react to each other's fiscal behavior regarding deficits or surpluses, then neighbors' decisions are endogenous and correlated with the error term and we expect to estimate a nonzero ρ. As noted by Anselin (1988) this endogeneity means OLS yields a biased estimate of the spatial parameter ρ. In the extant literature using spatial econometrics there are two approaches for getting consistent estimates of ρ. The first is the Maximum Likelihood (ML) based approach (Case, Rosen, & Hines, 1993; Besley & Case, 1995; and Brueckner & Saavedra, 2001). The second is a two stage least squares estimation using instrumental variables (Devereux et al. 2008; Liu and Martinez-Vazquez, 2014). In this paper I am implementing the second method. As part of a single country (and hence being economies in the same region), states are bound to be subject to correlated shocks..

The GMM IV approach gives consistent estimates in the presence of spatial error dependence (Kelejian and Prucha, 1998).

Even if we observe a high value of ρ still this may not mean that there is SBC in the Indian state finances. Rather this state-state interaction might be a result of interaction of expenditure level – states might be under some form of 'yardstick competition' or policy diffusion to match the spending levels of comparable states (Case et al. 1993). To test for this possibility we are going to estimate models similar to (1) for the different major expenditure categories. Expenditure on general administration (including interest payments), education, and health constitute almost 70 to 80 percent of state government expenditures. Therefore it makes sense to use the expenditure on education and health as two such expenditure categories. Moreover, from the expenditure on general administration I have excluded the interest payment, and taken the rest (which signifies the general expenditure on administration) as the third category. Finally, from within the other 20-30 percent of the expenditure the two major categories, namely, expenditure on rural development and transport and communication are taken to test this competing hypothesis. Estimated positive values for the spatial lag variables in these models (expenditure as dependent variable) will tell us that the expenditure decisions on these items of each state are affected by its neighbors' decision which ultimately results in an interaction at the aggregate deficit level (and resulting in higher deficit by mimicking the neighbors in the aggregate), rather than the interaction being a direct result of deficit mimicking behavior. This evidence would then support yardstick competition. However, if we find that there is not enough evidence for expenditure mimicking following the yardstick competition theory (or for that matter policy diffusion), but there is deficit

mimicking behavior at the aggregate level and along with that we have strategic behavior (on part of the states) with respect to Finance Commission and Planning Commission transfers, then we can interpret that evidence in support of the existence of SBC instead of yardstick competition.

3.4.2. The Weight Matrix

The cornerstone of our analysis is the idea that the fiscal behavior of any state is partly affected by the behavior of the neighboring states. We are attempting to capture this interdependence by incorporating the spatially lagged or spatially weighted measure of fiscal behavior into the equation. The structure of the weighting matrix is an assumption imposed on the nature of interaction and the definition of neighborhood. Therefore to test the robustness of the results to the specific assumption made must be checked using different weighting schemes. In its cross section form the weight matrix is an nxn matrix (where *n*=number of states). Since no state can be its own neighbor hence the diagonal elements are set to zero. The off-diagonal elements contain the weight given by state *i* to the fiscal behavior of state *j*. The rows are normalized to sum to unity. The off diagonal elements define who are considered as 'neighbors' and who are not. There are different weighting schemes used in the literature employing spatial econometric methods. These include equal weights, inverseeconomic distance weights, equal contiguity weights, and inverse of geographic distance weights (distant states do not matter as much as closer neighbors).

In my analysis I have implemented four different weighting schemes.

a. ***Contiguity Weights***: The next weight scheme is the usual and simple contiguity or shared border weights. In this weight matrix if two states share a border then they are defined as neighbors and the corresponding element in the weight matrix is set equal to 1. If two states do not share any border then the corresponding element in the weight matrix is set to zero. This matrix is created using a visual inspection of a political map of India as of 2000. The weight matrix is then row normalized. The reason for using a 2001 map instead of a current map is that in 2001 each of the three states of Bihar, Madhya Pradesh and Uttar Pradesh were bifurcated into two states each. However, I have excluded these new three states from my sample due to data problems. I am imposing the assumption that states which have ceased to share borders due to these bifurcations post 2001, still maintain their 'neighborliness'.

b. ***Inverse Economic Distance Weights (Two different Weighting Schemes)***: It is however quite likely that although all the other states are considered, but states 'close' in some economic sense to the state whose behavior is under consideration is given higher weight than others. The next two weight matrices implement this idea. The first of these are based on per capita gross state domestic product (GSDP) and the second is on the poverty rate. In each of these weight matrices the off diagonal elements are defined as $1/\left|\bar{z}_i - \bar{z}_j\right|$. In this expression z denotes the variable that is being considered. For the weights based on GSDP, this is the per capita GSDP, while for the poverty rate based based weight matrix this is the poverty ratio (head count ratio). The bar on top of z signifies that the value of the variable being considered for calculating the weights is the sample average. Finally each element of the matrix is divided by the row total to make the matrix row standardized.

c. ***Political Affiliation Weights***: All the above four weight matrices are originally created as cross section matrices and then they are converted into panel format matrices using the assumption that the pattern of interdependence across states remained the same across the entire sample period. Moreover, in each of the above matrices either economic consideration or Geography is given prominence. However, for my last weighting scheme I have relaxed both of these two assumptions. When a state government decides about fiscal matters it is quite possible that the elected officials will look at states governed by their party colleagues or coalition partners for guidance. For constructing this last weight matrix I have considered the political party or coalition that governed each state during each of the years in my sample. If two states were governed by the same party or by two parties belonging to the same political coalition then the corresponding element in the weight matrix is set to equal to 1. The element remains zero otherwise. Finally, the elements of the matrix are row standardized.

3.4.3. Data and Control Variables

Our sample period covers the period 1987-2007[19] and the sample of states consists of the non-special category states. Currently India has twenty nine states. Three of these states came into being in 2001 (Jharkhand, Uttarakhand, and Chhattishgarh). Among the other twenty six states, the states from north eastern India (Arunachal Pradesh, Assam, Meghalaya, Manipur, Mizoram, Nagaland, Sikkim and Tripura) and Himachal Pradesh are categorized as 'Special Category' states. For the purposes of center to state transfer and grants these states enjoy special benefits and hence are generally excluded from

[19] The global recession started in 2008 and therefore I am skeptical to extend the sample period beyond 2007. Otherwise, data is available up to 2011-2012.

studies covering the non-special category states. The three new states (Jharkhand, Uttarakhand, and Chhattishgarh) are excluded from the sample as the data pertaining to them only starts from 2001. Finally, Jammu and Kashmir which enjoys both constitutional special status and fiscal special status (included in the 'Special Category' state list) is also excluded. For the period 1987-2004, the source of the fiscal data is the State Finance Accounts (audited) published by the Auditor General's (CAG) office every year. The fiscal data for 2005-2007 are collected from the Study of State Budgets published by the Reserve Bank of India.

Most of the elements of the state characteristic matrix are straight forward. Larger states (with higher population) can be expected to have higher expenditure needs compared to smaller states due to the sheer size and diversity of the population. For some expenditure categories although the economies of scale might help the larger states to spend less in per capita terms, but geographic and demographic spread seem to negate much of such advantage. As an indicator of the size of the states I include the relative population or share of the state population in the total population as a control variable. Richer states have larger revenue bases and hence can be expected to have lower deficits (or higher surplus) in the aggregate, but not necessarily in per capita terms. However, other the richer states in India (except Maharashtra) are in the middle sized section, and as a result we expect them to have lower deficits in per capita terms as well. Per capita Gross State Domestic Product at constant prices (GSDP) is taken as a measure of the wealth of the state. Wealthier states are expected to have more tax resources and lower deficit ratios. States with higher proportion of poor people have higher needs than other states and may be forced to incur deficits and to account for this factor I include the

Poverty Rates of the state as a control variable. Heller (2005) has introduced the concept of Fiscal Space. Jurisdictions with higher Fiscal Space have better maneuverability in fiscal matters. I operationalize Fiscal Space as the difference between the own tax and non-tax revenue (including share in central taxes) and compulsory expenditure obligations of the states (normalized by the former). The compulsory expenditure obligations of the Indian States are more or less included into the category of Non-Plan Revenue Expenditures[20]. Finally, I include two dummy variables to capture the political environment of state policy making. The importance of both of these dummy variables has already been discussed in a previous section. The first dummy variable D_{it} is one if the fiscal year is just preceding the constitution of a new Finance Commission, and zero otherwise. The second dummy variable *Pit* is equal to one if the same party or coalition of parties governed both a state and the center, and zero otherwise[21]. The state characteristic variables are all lagged by one period. I have estimated the same models using contemporaneous values of these variables without the estimated coefficients changing qualitatively (sign and statistical significance).

The two dummy variables D and P are constructed from information available publicly about the Finance Commissions and Governments of the different states over the sample period. The state GDP, population and poverty rate data are collected from

[20] Till last year Indian budgets were broken down into two categories – Plan Expenditure and Non-Plan Expenditure – both in the Revenue and Capital Account. Plan expenditure is the part of expenditure (mainly new investment) which is for projects under the current Five Year Plan. All expenditure for the routine functioning of government and for projects started in a previous Five Year Plan (whose five year period has already elapsed) are included in Non-Plan Expenditure.

[21] Khemani (2003) uses a stricter criterion for a similar dummy variable in her analysis. While I have allowed the variable to take value one if the state is governed by a party belonging to the coalition that governs the center, she only allows strict matching of party identities.

Central Statistical Office (CSO) website. The population and poverty rates are not available as annual data. The former is available as decadal data (for the Census Years, 1980, 1990, 2000, 2010 etc.), while the latter is calculated from the Large Sample Consumer Expenditure Surveys conducted by the National Sample Survey Organization (NSSO) more or less once every five years. The missing population values are imputed using an exponential growth rate formula for each state. On the other hand the missing poverty rates are imputed using an arithmetic decay rate.

3.5. Results and Discussion

In our analysis, Gross Fiscal Balance (Deficit or Surplus) is taken as the indicator of state fiscal discipline. The Gross Fiscal surplus or deficit is defined as the revenue receipt plus recovery of loans minus the sum total of revenue expenditure[22], total capital outlay and state loans to sub-state organizations[23]. The other measure of surplus or deficit that we could use is the overall surplus or deficit defined as the total of the balances on the revenue and capital accounts. However in government official statistics sources the gross fiscal balance is presented as the measure of fiscal balance of the different levels of government. This is also the measure favored, and clearly and consistently defined by the Budget Documents, the RBI and the Comptroller and Auditor General (CAG) of India. Due to the emphasis put on this particular definition of gross fiscal balance within the Indian public finance policy circles we think it is proper to use it as the measure of

[22] Revenue Expenditure in India is a government expenditure classification which includes current expenditure of the government or Government Final Consumption Expenditure including interest payments.
[23] This definition is slightly different from the IMF definition where the loans to sub-state organizations are not included.

interest. For our sample period (1987-2007) none of the states exhibit gross fiscal surplus. The deficit to GDP ratio has consistently been above or close to three percent of GDP. In Table 2, I present the statewise summary (mean) of the variables used (except the dichotomous or dummy variables).

Table 3.1: Statewise Averages of the Variables Used (1987-2007)

States	(1) Gross Deficit	(2) Fiscal Space	(3) Poverty Ratio	(4) Population Share	(5) GSDP per capita
Andhra Pradesh	-0.035	0.270	19.025	0.086	220.698
Bihar	-0.052	-10.287	47.064	0.090	77.925
Gujarat	-0.039	-0.075	20.652	0.056	288.606
Haryana	-0.026	3.431	16.104	0.023	330.645
Karnataka	-0.031	9.344	27.954	0.060	237.058
Kerala	-0.044	-12.511	19.857	0.037	270.704
Maharashtra	-0.031	-3.759	32.046	0.107	325.857
Madhya Pradesh	-0.038	2.513	39.801	0.066	155.012
Odhisha	-0.052	-13.563	48.180	0.042	161.473
Punjab	-0.050	-21.172	9.570	0.027	325.684
Rajasthan	-0.048	-15.138	23.704	0.061	178.028
Tamil Nadu	-0.028	-1.739	28.742	0.072	265.853
Uttar Pradesh	-0.049	-16.775	35.232	0.182	133.277
West Bengal	-0.046	-37.277	31.583	0.090	190.904

Gross State Domestic Product (GSDP) is in Per Capita terms, and at 2004-05 constant prices.
Gross Deficit is expressed as a percentage of GSDP (at Current Price)

The estimated models are presented in Tables 2, to 6. The estimates in table 2 are from six models – two each for each of the weighting schemes (geographic contiguity, Inverse GSDP, Poverty ratio, and Political Similarity). Each model uses temporally lagged (one period) values of the control variables including the lagged dependent variable. The odd numbered models for each weighting scheme use temporally lagged

values of the spatially lagged (weighted average of the neighbors' fiscal deficit variable) variable, while the even numbered ones use contemporaneous values of the same variable. In all the models, irrespective of weighting scheme or how the spatial lag variable is included, the temporally lagged dependent variable has a positive and statistically significant coefficient. We expected this from the beginning. This coefficient captures the strong time persistence of fiscal behavior. The coefficient on Finance Commission dummy is negative and statistically significant. The dependent variable is a deficit/surplus variable. Therefore, a negative coefficient means surplus declines or deficit increases. We have already noted that within our sample none of the states ever enjoyed a surplus. Therefore, this coefficient supports the claim of previous authors that the states incur higher deficit in the years preceding the establishment of a Finance Commission. As explained earlier this implies that states strategically attempt to show a poor fiscal condition to draw relatively more from the common pool of resources to be distributed by the FC. The coefficient of the political affinity with the center variable is always positive and contradicts our general expectation that states with similar party/coalition government as the center would be trying to incur more deficit (also contradicts the evidence found by Khemani (2000, 2003). However, the coefficient is never statistically significant. Although this coefficient is not statistically significant, but the sign of the coefficient seem to support the conclusions of Goodspeed (2002) that central government tries to win support in areas where it is weak, and hence in Planning Commission type negotiations states governed by opposition (or regional parties) hold the aces. For the first three types of weighting schemes, namely, contiguity weights, inverse GDP difference weight, and poverty weights, the coefficient on the spatially

lagged variable is positive and statistically significant if we enter it with one period lag. But the statistical significance goes away when we enter it into the model contemporaneously. For the political affinity weights the variable is never significant, although the sign remains as expected[24].

The coefficient on the spatial lag variable is the largest when we use the poverty weights with the inverse GSDP weights and contiguity weights coming second and third. This is indicative of the importance of the issue of poverty in the Indian political and economic context relative to average income level or geographic closeness. State policy makers are most concerned with states with similar poverty levels. Consideration of overall economic situation (as captured by per capita GSDP) and geographic nearness comes after that. It seems that state policy makers' decisions regarding deficit and surplus are affected most by those states that have a poverty level close to their own state's poverty level. They seem to strongly expect the central government to treat states with similar or close poverty levels similarly. Here, one could be tempted to interpret this coefficient not as an indicator of strategic interaction across states but rather as an indicator of 'similarity' of finances of states with similar poverty levels. However, the poverty ranking of states is not exactly mirrored by the per capita GSDP ranking and geographic closeness (in fact there are wide variation when we compare the three rankings). Yet, when we use those weights we still get evidence of slightly weaker but still quite strong strategic interaction among states. If it was only that the finances of similarly poor states are similar and there is no strategic interaction across state finances,

[24] The political affinity weight matrix is a very sparse matrix and may not capture the political neighborliness really well.

then those two weighting systems should not give evidence of any interaction at all, at least not at the level and strength as our results show.

From these results it appears that states consider the weighted average of neighbors' (as defined in the different weighting schemes except for the political affinity weights) fiscal behavior/condition of past year to decide about their own course of action regarding gross fiscal balance. However, it does not appear that the behaviors are contemporaneously jointly decided as if in the states are playing a Nash game with each other. Thus we tentatively conclude that there is some gross fiscal balance mimicking going on among the states in our sample, that is, neighbors' behavior matter. Above we have argued that this mimicking could not be a result of just some natural or organic similarity inherent in similar states. However, as we discussed earlier, this 'aggregate' level mimicking may be a result of expenditure category specific mimicking or yardstick competition or even some spillover effect. States might actually be looking at their neighbor's (poverty level based or based on geographic or economic similarity) expenditures across different categories and then trying to follow. A related explanation may also be found in the idea of policy diffusion. If the general trend is spending more on (say) education then other states might start doing the same by 'learning'. Such category specific similarity in expenditures may ultimately be aggregated into similar levels of fiscal surplus or deficit. However, at the outset we note one important point. Yardstick competition to be the alternate explanation to the evidence of strategic interaction in deficits that we found, we need to find evidence of expenditure mimicking in all if not all the expenditure categories (like Case et. al. 1993). It is not quite plausible that states would be affected by yardstick in one or two expenditure categories. On the other hand

spillover effect to be an acceptable counter explanation we need to find negative effects in those expenditure categories that actually spills over across border, especially most strongly while using the geographic contiguity weight. In addition for those expenditure categories that cannot have any spillover effect across states. Next we test these alternative possibilities.

Table 3.2: Effect of Neighbors' Gross Fiscal Balance

	Contiguity Weight		Inverse GSDP Weight		Poverty Weight		Political Similarity Weight	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Spatial Lag (One Lag)	0.268***		0.277***		0.307***		0.0700	
	(3.454)		(3.802)		(6.458)		(1.343)	
Spatial Lag (Contemp.)		0.157		0.107		0.131		0.0614
		(1.761)		(1.172)		(1.688)		(1.022)
(own) Lagged Dep. Var	0.603***	1.248***	0.606***	1.163***	0.560***	1.168***	0.651***	1.396***
	(6.066)	(8.968)	(6.385)	(7.350)	(6.347)	(10.08)	(8.011)	(9.323)
Fiscal Space	8.81e-05	-0.000173*	0.000107**	-5.64e-05	0.000117**	-8.82e-05	0.000138**	-0.000215
	(1.681)	(-1.796)	(2.356)	(-0.516)	(2.474)	(-0.839)	(2.912)	(-1.704)
Poverty	-0.000471	0.00426***	-0.000227	0.00324**	-0.00109	0.00310**	-0.00153	0.00478**
	(-0.364)	(3.317)	(-0.151)	(2.620)	(-0.828)	(2.604)	(-1.234)	(2.628)
Population Share	-0.000625	-0.00402***	0.000123	-0.00300**	-1.04e-05	-0.00312**	-9.07e-05	-0.00474**
	(-0.285)	(-3.701)	(0.0507)	(-2.443)	(-0.00392)	(-2.578)	(-0.0475)	(-2.847)
Per Capita Real GSDP	-0.00144	-0.00245**	-0.00102	-0.00221**	-0.000858	-0.00201*	-0.00169	-0.00292**
	(-1.099)	(-2.598)	(-0.668)	(-2.314)	(-0.478)	(-2.035)	(-1.126)	(-2.649)
Finance Commission	-0.0106***	-0.0107***	-0.0104***	-0.0110***	-0.0103***	-0.0110***	-0.00961***	-0.0119***
Dummy	(-6.073)	(-4.409)	(-6.447)	(-4.646)	(-6.305)	(-5.068)	(-5.738)	(-4.878)
Affinity with Center	0.000697	0.00106	0.00112	0.00111	0.00109	0.00109	0.00126	0.00145
	(0.510)	(0.765)	(0.858)	(0.866)	(0.820)	(0.830)	(0.888)	(0.928)
Time Trend	Yes	Yes	Yes	Yes	Yes	yes	Yes	Yes
Jurisdiction Fixed Effect	Yes	Yes	Yes	Yes	Yes	yes	Yes	Yes
Observations	280	280	280	280	280	280	280	280
Number of states	14	14	14	14	14	14	14	14
First Stage F-Stats (8,14)	4686	4569	1400	3375	1419	2964	19570	839.5
AR(1) (p-value)	0.0104	0.0264	0.00980	0.0249	0.00915	0.0201	0.00706	0.0214
AR(2) (p-value)	0.488	0.521	0.457	0.561	0.487	0.526	0.640	0.482

Robust t-statistics in parentheses: *** p<0.01, ** p<0.05, * p<0.1

In the Indian public accounting system the expenditures of each state are categorized into Economic Services, Social Services and Administrative Services. Social Services include expenditure on Health and Education, and Administrative Services include expenditure on General Government Services and Interest Payments on previous debts. Together, Health, Education and Administration constitute around 70 to 80 percent of state government expenditure for each state. After eliminating the interest payments from the administrative services expenditures, these three categories still cover the lion's share of the total state government expenditures. Therefore, to test the interaction in expenditures these three categories (education, health, and administrative services excluding interest payments) seem to be the natural three choices. From within Economic Services, I include two other categories – rural development[25] and transport and communication (roads, bridges etc.). In total these give me five expenditure categories which cover around 65 to 80 percent of the total expenditure of the state governments. Tables 3 through 6 present these estimation results. Each of these four tables shows the results for each of the four weighting schemes. In table 2 we saw that when the spatially lagged variable is entered contemporaneously, the coefficient estimates are not statistically significant. Therefore in the models of tables 3 to 6 we are only estimating models with the spatial lag variable entering with one period lag. From the perspective of yardstick competition, if it was present, we should find it most strongly in Health, Education, Rural Development and Transport. These are the categories where one state might want to follow the lead of others – especially its neighbors.

[25] Urban development expenditure, inexplicably, is categorized under Social Services and is not a very large share of state government expenditure.

Table 3.3: Estimation Results for Different Major Expenditure Categories (Inverse Geographic Distance Weight)

VARIABLES	Rural Development (1) Model 9A	Transport & Communication (2) Model 9B	Education (3) Model 9C	Health (4) Model 9D	Administration (5) Model 9E
Spatial Lag (with one period lag)	-0.0805	-0.00141	0.0357	0.0244	-0.178
	(-1.017)	(-0.0195)	(0.789)	(0.385)	(-1.275)
Lagged Dependent Variable	0.624***	0.781***	0.827***	0.818***	0.748***
	(7.986)	(12.15)	(38.27)	(24.59)	(12.02)
Fiscal Space	3.77e-06	7.72e-06**	3.51e-06	-1.47e-06	-7.50e-05
	(0.650)	(2.226)	(0.329)	(-0.552)	(-1.675)
Poverty	0.00235***	-5.59e-05	0.00196	0.000416	0.00250
	(5.544)	(-0.604)	(1.727)	(1.664)	(1.751)
Population Share	-0.000228	-0.000529**	-0.000653	-0.000115	-0.00306
	(-0.437)	(-2.395)	(-0.876)	(-0.548)	(-1.443)
Per Capita Real GSDP	-0.000955	-5.32e-05	-0.000720	-2.86e-05	-0.000445
	(-1.698)	(-0.359)	(-0.863)	(-0.171)	(-0.264)
Finance Commission Dummy	0.000562*	-0.000146	0.000462	0.000314***	0.000120
	(2.072)	(-1.241)	(1.101)	(3.596)	(0.127)
Affinity with Center	0.000105	-0.000116	-0.000284	-0.000236	-0.000721
	(0.443)	(-1.401)	(-0.629)	(-1.591)	(-1.429)
Time Trend	Yes	Yes	Yes	Yes	Yes
Jurisdiction Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	280	280	280	280	280
Number of state1	14	14	14	14	14
First Stage F-Statistics (9,14)	191	1932	13651	17203	2874
AR(1) (p-value)	0.0148	0.00355	0.0841	0.0338	0.0550
AR(2) (p-value)	0.121	0.183	0.285	0.0723	0.104

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.4: Estimation Results for Different Major Expenditure Categories (Inverse GSDP Distance Weight)

VARIABLES	Rural Development (1) Model 10A	Transport & Communication (2) Model 10B	Education (3) Model 10C	Health (4) Model 10D	Administration (5) Model 10E
Spatial Lag (with one period lag)	-0.107	0.0591	0.152*	0.0952	-0.207***
	(-1.083)	(1.269)	(1.936)	(1.130)	(-3.388)
Lagged Dependent Variable	0.638***	0.777***	0.807***	0.798***	0.765***
	(7.737)	(11.31)	(31.96)	(26.95)	(12.68)
Fiscal Space	3.83e-06	7.49e-06*	8.07e-06	-1.73e-06	-5.28e-05
	(0.638)	(2.065)	(0.812)	(-0.686)	(-1.667)
Poverty	0.00240***	1.61e-05	0.00135	0.000311	0.00190
	(5.008)	(0.121)	(1.290)	(1.102)	(1.288)
Population Share	-0.000231	-0.000534**	-0.000901	-0.000154	-0.00278
	(-0.365)	(-2.219)	(-1.198)	(-0.805)	(-1.494)
Per Capita Real GSDP	-0.00101	-0.000194	-0.00113	-8.66e-05	0.000252
	(-1.718)	(-1.285)	(-1.183)	(-0.549)	(0.162)
Finance Commission Dummy	0.000546*	-0.000162	0.000487	0.000324***	-6.59e-05
	(2.054)	(-1.540)	(1.177)	(3.729)	(-0.0644)
Affinity with Center	9.67e-05	-0.000111	-0.000220	-0.000242	-0.000767
	(0.393)	(-1.425)	(-0.489)	(-1.654)	(-1.302)
Time Trend	Yes	Yes	Yes	Yes	Yes
Jurisdiction Fixed Effect	Yes	Yes	Yes	Yes	Yes
Observations	280	280	280	280	280
Number of state1	14	14	14	14	14
First Stage F-Statistics (9,14)	220.4	2030	20346	9831	1289
AR(1) (p-value)	0.0145	0.00411	0.0906	0.0367	0.0480
AR(2) (p-value)	0.129	0.183	0.305	0.0755	0.0881

Robust t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 3.5: Estimation Results for Different Major Expenditure Categories (Inverse Poverty Distance Weight)

VARIABLES	Rural Development (1) Model 11A	Transport & Communication (2) Model 11B	Education (3) Model 11C	Health (4) Model 11D	Administration (5) Model 11E
Spatial Lag (with one period lag)	-0.145	0.0791	0.0569	0.0822	0.0311
	(-1.182)	(0.764)	(0.733)	(1.377)	(0.152)
Lagged Dependent Variable	0.641***	0.780***	0.832***	0.826***	0.740***
	(7.548)	(11.35)	(37.65)	(26.45)	(9.679)
Fiscal Space	4.63e-06	7.08e-06*	5.80e-06	-1.14e-06	-4.70e-05
	(0.654)	(1.781)	(0.603)	(-0.712)	(-1.046)
Poverty	0.00236***	-6.75e-05	0.00170	0.000294	0.00174
	(4.716)	(-0.835)	(1.263)	(1.107)	(0.871)
Population Share	-0.000595	-0.000472*	-0.000344	-3.50e-05	-0.00272
	(-1.030)	(-1.812)	(-0.346)	(-0.149)	(-1.006)
Per Capita Real GSDP	-0.00110**	-9.77e-05	-0.000565	-4.78e-05	-0.000974
	(-2.224)	(-0.765)	(-0.619)	(-0.331)	(-0.571)
Finance Commission Dummy	0.000574**	-0.000168	0.000465	0.000324***	0.000391
	(2.148)	(-1.486)	(1.105)	(3.710)	(0.391)
Affinity with Center	0.000137	-0.000113	-0.000292	-0.000244	-0.000732
	(0.577)	(-1.516)	(-0.676)	(-1.679)	(-1.443)
Time Trend	Yes	Yes	Yes	Yes	Yes
Jurisdiction Fixed Effect	Yes	Yes	Yes	Yes	Yes
Observations	280	280	280	280	280
Number of state1	14	14	14	14	14
First Stage F-Statistics (9,14)	281.6	1191	18815	44361	1297
AR(1) (p-value)	0.0151	0.00396	0.0904	0.0355	0.0556
AR(2) (p-value)	0.113	0.182	0.309	0.0771	0.0984

Robust t-statistics in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 3.6: Estimation Results for Different Major Expenditure Categories (Inverse Political Distance Weight)

VARIABLES	Rural Development (1) Model 12A	Transport & Communication (2) Model 12B	Education (3) Model 12C	Health (4) Model 12D	Administration (5) Model 12E
Spatial Lag (with one period lag)	-0.0258	-0.0275	0.0201**	0.0412***	0.0103
	(-1.092)	(-0.741)	(2.197)	(3.567)	(0.409)
Lagged Dependent Variable	0.625***	0.775***	0.825***	0.819***	0.737***
	(8.092)	(11.93)	(37.08)	(23.05)	(10.86)
Fiscal Space	5.10e-06	7.55e-06**	-1.00e-06	-2.97e-06	-5.26e-05
	(0.801)	(2.343)	(-0.141)	(-1.606)	(-1.649)
Poverty	0.00215***	-3.96e-05	0.00204*	0.000392*	0.00196
	(3.919)	(-0.478)	(2.057)	(1.972)	(1.291)
Population Share	-0.000313	-0.000548**	-0.000585	-9.77e-05	-0.00295
	(-0.592)	(-2.336)	(-0.779)	(-0.484)	(-1.580)
Per Capita Real GSDP	-0.00101*	-4.17e-05	-0.000608	-3.37e-05	-0.00111
	(-1.863)	(-0.371)	(-0.663)	(-0.200)	(-0.660)
Finance Commission Dummy	0.000536*	-0.000131	0.000496	0.000338***	0.000388
	(2.019)	(-1.237)	(1.229)	(4.368)	(0.447)
Affinity with Center	0.000137	-9.87e-05	-0.000265	-0.000231	-0.000740
	(0.600)	(-1.348)	(-0.599)	(-1.583)	(-1.438)
Time Trend	Yes	Yes	Yes	Yes	Yes
Jurisdiction Fixed Effect	Yes	Yes	Yes	Yes	Yes
Observations	280	280	280	280	280
Number of state	14	14	14	14	14
First Stage F-Statistics (9,14)	226.3	1937	11537	4775	1347
AR(1) (p-value)	0.0137	0.00407	0.0877	0.0328	0.0609
AR(2) (p-value)	0.106	0.190	0.283	0.0717	0.106

Robust t-statistics in parentheses: *** p<0.01, ** p<0.05, * p<0.1

The results from tables 3 to 6 tell us that there is no obvious pattern of strategic interaction in expenditure categories to support yardstick competition. Except for health and education under political affinity weighting scheme none of the other spatial lag coefficients are statistically significant or even large enough to attract our attention. On the other hand, the lagged dependent variable is always significant and has quite large coefficient as well. We found similar result in table 2 as well. This again indicates the strong time persistence of fiscal policy. The most important factor influencing a state's expenditure in any category is thus its past expenditure in the same category. Rural development has a negative sign. This is unexpected by yardstick competition. We have already found that at the aggregate level deficit of one state begets deficit of another. To bolster yardstick competition as the counter explanation of this observed fact we need the sign of spatial lag variables to be positive which would imply more expenditure in a category by neighboring states begets more expenditure in the home state. However, the evidence points to the existence of some spillover effect in rural development expenditure. Rural laborers are most likely to travel to the geographically neighboring states and thus create this spillover effect. However spillover effect reduces expenditure and hence helps to better the deficit scenario. Thus aggregating spillover effect we cannot get a counter explanation to the existence of SBC. Transport has both positive and negative coefficients across different weighting schemes. Only the expenditures on education and health are always positive. That means there might be some evidence that states are influenced to mimic the expenditure pattern of neighbors (as defined by different weighting schemes) in education and health. Following Case et al (1993) one can take this to indicate that for these two categories the states seem to behave as if there

is some yardstick competition going on. However, both the coefficients are only statistically significant when we use political affinity weight. We have already seen that due to the sparse nature of the political affinity weight matrix this is not a very good weighting scheme. Moreover, as we already noted if yardstick competition is present then that should manifest in other categories as well, and not just two. Coming to the Finance Commission dummy and Affinity with Central government dummy variables, we again find no clear pattern. Therefore, when we analyze individual expenditure categories, we do not find any clear and unequivocal counter explanation in the theory of yardstick. There is some weak evidence of yardstick competition in health and educational expenditure only but nothing as conclusive as the evidence in support of SBC at the aggregate level.

3.6. Conclusion

In this paper we started out to search for empirical evidence of soft budget constraint in Indian state finances. Towards that end we modeled the fiscal deficits or surpluses of states as functions of the fiscal deficits or surpluses of 'neighboring' states using a spatially and temporally lagged dynamic model. We defined neighborhood using geographic, economic and political factors. We hypothesized that if the states are found to positively (negatively) respond to the surpluses (deficits) of neighboring states – that is if the coefficient is positive after other factors that are likely to affect the surplus or deficit are accounted for – then we can conclude that strategic interaction is present in Indian state finance. Moreover, we also postulated that if such interaction is not resulting from some underlying pattern of interaction in major expenditure categories, then that would be symptomatic of the existence of soft budget constraint. Towards this second

goal we modeled the expenditure in major expenditure categories using similar models as those for the deficits/surpluses.

Throughout our sample period none of the states enjoyed a positive Gross Fiscal balance. Thus the positive coefficient on the spatial lag variable in the deficit/surplus equations mean that an increase in Gross Fiscal Deficit (as % of GDP) by neighbors induces a state to increase its own Gross Fiscal Deficit (as % of GDP). There is also evidence to support that states use deficits strategically to get more from the Fiscal Commissions. Moreover, our models for the expenditure categories failed to offer any clear pattern or even any consistently statistically significant pattern of interaction in the major expenditure categories. In India, explicit bailouts by the central government (Government of India) have not happened till date. Thus we can only indirectly observe the states' expectations of 'implicit bailout' by the effect of other states' deficit behavior on its own. In this interpretation the positive coefficient on the spatially lagged variable tells us that states do not expect to be 'punished' in any way for incurring deficits when their 'neighbors' also incur deficits. They expect their budget constraint to be soft and the central government to come to their rescue using grants and transfers. Therefore, the above results give evidence towards the existence of a soft budget constraint situation in the state finances of India.

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Chapter 4: Essay 3 – Testing the Theory of Budgetary Punctuation Using Indian State Budget Data

4.1. Introduction

Budget, as one of the relatively more obvious instruments and indicators of policy focus of governments and the external manifestation of the choices among alternative usages of scarce resources, can be expected to exhibit the same pattern of dynamics and change as most other policy instruments. Incrementalism, which was developed by Davis and colleagues during the 1960s and early 1970s, was the dominant explanation of the public budgeting process for a considerable time period over the last century (Davis et al., 1966a and 1966b; Davis, 1974). This theory of incrementalism tells us that the budget of a year can be expected to be different from the previous year only by a small percentage with exceptional changes being rare phenomena. However, this theory of budgetary policy change came under serious scrutiny from almost the very beginning (Wanat, 1974; Bailey and O'Connor, 1975; Dempster and Wildavsky, 1979; Berry 1990). Several studies have found that budget data are characterized by a substantial number of dramatic changes over previous years which cannot be explained by the incremental theory of policy change (Natchez and Bupp, 1973; Danziger, 1978; Boyne et al. 2000). In 1993 Baumgartner and Jones introduced the theory of Punctuated Equilibrium, initially developed in the field of Paleontology and Evolutionary Biology, to the study of policy dynamics. The theory of Punctuated Equilibrium was offered as an extension, improvement and replacement of the incrementalist theory.

Based on the concept of disproportionate information processing theory, bounded rationality and agenda based policy making, the Punctuated Equilibrium Theory

describes policy processes as characterized by long periods of stability interrupted by rapid and large changes. Bounded rationality of policy makers, oversupply of information, and institutional frictions (Mortensen, 2005) are claimed to result in both stability and punctuation in policy making. Researchers have applied this theory to study budgetary changes along with other policy areas in several countries.

Till now, this theory has been applied and tested in quite a few western industrial democracies with developed democratic political and policy making systems – both at national and sub-national levels. Within these studies there is a preponderance of USA based studies (Jones, Baumgartner, and True, 1998; Jordan, 2003; Robinson, 2004; Breunig and Koski; 2006; Ryu, 2009). The other countries that have been analyzed are UK (Breunig, 2006; John and Margetts, 2003), Denmark (Mortensen, 2005), France (Baumgartner, Foucault and Francois, 2006) and Germany. In these studies the authors have generally found the budgeting processes to follow the predictions of the Punctuated Equilibrium Theory. However, there has been no attempt yet to test the applicability of this theory of budgetary policy dynamics in the context of developing or transition countries.

In this paper we extend this literature by testing the applicability of Punctuated Equilibrium Theory to analyze the budget data of Indian states. We attempt to understand whether the pattern predicted by this theory and observed in the context of the developed industrialized countries above is also present in the behavior of budgets in a developing country like India. On the one hand the political process in the states within the federal system of India are much more central government dominated (through grants – both conditional and unconditional, loans and insufficient revenue decentralization to the

subnational levels) compared to the USA, while on the other hand, the process is more federal in nature compared to the UK system from which it originated. The state policy making process is also substantially different from the countries that has already been studied – with political agenda being mainly dominated and directed by the political parties, higher levels of illiteracy, lower political awareness among the electorate, lower effects of grassroots politics and public opinion in the policy making process, and a multiparty system which many times results in coalition governments. Whether such differences affect the dynamics of policy is an important and interesting question that we try to answer in this paper. Jones et al. (2009) have termed Punctuated Budgets as the 'general law of budgeting'. However, in the context of India just observing stasis and jumps in budgetary data may not be enough to support this 'general law'. It has already been commented that budgetary marksmanship in India suffers from forecast error (Chakraborty and Sinha, 2008). Thus the observed pattern of stability and punctuations may simply be due to error correction by the Finance Department from last year's estimates (difference between last year's budget estimates and revised estimates) or last to last year's estimates (difference between last to last year's budget estimates and actuals)[26]. To be able to conclusively accept the applicability of Punctuated Equilibrium Theory, in this paper we also test the alternative explanation of forecast error correction. The rest of this paper is organized in four more sections. Section II discusses the theoretical background of the paper and the hypotheses. In section III, we elaborate on

[26] The fiscal year in Indian states runs from April to March. The budget is generally presented in Indian state legislatures by the Minister of Finance of the state government during end of February to middle of March. The preparation of the budget by collecting the Demand for Grants from each Ministry or Departments starts around September of the previous year and continues till February. At the time of preparation of the Budget of any fiscal year, the Revised Estimate figures of the previous fiscal year and the Actuals/Accounts figures of the year prior to the previous fiscal year are available for consideration.

the data and method of my analysis; section IV discusses the results. The final section concludes the paper.

4.2. Theoretical Background and Hypotheses

Decision making at the government level is characterized by disproportionate information processing (Jones and Baumgartner, 2005). Disproportionate Information Processing (DIP henceforth) is the general formulation of the punctuated equilibrium model. The basic assumptions of both the incrementalist theory and DIP are the same. Both assume bounded rationality and serial information processing among policy makers and institutional friction in the processing capacity of political organizations (True, 1999, p. 97). However, for incrementalism these factors result in stasis and stability, while dramatic changes are relegated to the status of outliers. On the other hand, for DIP the same basic factors give a scenario of stability interrupted with punctuations which are not outliers but part of the system itself (Baumgartner and Jones, 2002). Therefore, incrementalism can be seen as a special case of DIP which focuses on periods of stability alone.

Policy making process is divided into a general macro-political level and specialized subsystems (Baumgartner and Jones, 1993). The subsystems are characterized by stasis in policy making and dampening of external shocks, while the macro-political theatre is characterized by conflicts, heightened attention and positive feedback processes which exacerbate and amplify shocks (Mortensen, 2005). Some policy issues regularly hit the macro-political agenda without being redefined and without the mobilization of new political actors. Some policy issues hit the macro-political agenda and disappear

again without causing sustained and institutionalized changes in the policy. Finally some policy issues never appear on the macro political agenda. The same serial decision processing that ensure stability in normal periods also ensure increased focus on new issues to the exclusion of others once the issue reaches the macropolitical stage (John and Margetts, 2003).

The preceding discussion leads to the first hypothesis that I want to test using the dataset of Indian state budgets.

Hypothesis 1: Indian state budgets are punctuated and follow the 'general law of budgets' as espoused by Jones and colleagues.

According to Jones and Baumgartner (2005) the level of institutional friction, information oversupply, availability of efficient information, interest mobilization through interest groups and interest configurations are different across different institutions and government organization. Thus the distributions of budgets changes should be different depending on the spending category we are looking at (Ryu, 2009). There are some spending categories where the beneficiaries are comparatively more organized into different visible and politically important interest groups. In the Indian context these are generally the employee and labor unions and employee coordination committees (of mid to low level government employees both within the bureaucratic mechanism and within the Public Sector Undertaking) which are affiliated to different political parties. Since the beneficiaries of these spending categories are relatively more organized, changes (especially downward) elicit much stronger and intense interest mobilization. On the other hand there are spending categories where even though the number of beneficiaries may be large but still they are neither organized nor politically

visible. Thus these two types of spending categories should exhibit different levels of punctuation. This leads to the following two hypotheses.

Hypothesis 2: The extent of punctuations in India's State Budgets varies across spending categories.

Hypothesis 3: Spending categories where the beneficiaries are more organized and visible suffer less from budgetary punctuations.

Finally, it is an important question to consider whether punctuated equilibrium theory is a valid explanation to the budgetary punctuation which we may observe in the data. There may be two objections in this regard. The first objection is whether it is appropriate to use subnational data for a country like India to test a theory like punctuated equilibrium. At least till 1991, Indian state finances were dominated by national planning objectives coming down from the central governments.[27] Thus the remnants of such a centrally driven system may still be in place reducing the policy autonomy of the states. However, we contend that the liberalization policy pursued post-1991 has reduced the importance of the centrally planned economic system in India and has created an environment where the policy autonomy of the states has been introduced. Moreover, this is also the same period when coalition governments became the rule at the central level and resulted in weaker central governments vis-à-vis the states. The second objection is that the observed budgetary punctuations may simply be corrections of forecast errors made by finance departments in previous year's budget. When the revised estimates (or accounts/actuals) for a year diverges too much (by percentage) from what had been

[27] In 1991 India faced a macroeconomic problem in the form of low forex reserves and declining value of Indian currency. Indian central government had to take external loans and liberalize the economy partly as condition of those loans.

budgeted earlier, we say that there was a large forecast error in the budgeted amount. This divergence may be a result of changing economic conditions which makes prior budget calculations invalid or may be results of political exigencies during the execution of the budget. If the budgetary punctuations are simply results of forecast errors committed earlier, then we get an explanation for the punctuations that compete with the punctuated equilibrium theory. This leads to the final hypothesis.

Hypothesis 4: The observed punctuated pattern of budgetary change can be attributed to forecasting error of the finance departments.

In the next section we elaborate on the data and method I have used to test these hypotheses.

4.3. Data and Methods

To study the extent of incrementalist vis-a-vis punctuated aspects of the budgets we have constructed a new dataset of Budget Estimates and Revised Estimates of revenue expenditures on twelve major categories of state functions across eighteen non-special category states. These are Andhra Pradesh, Bihar, Chhattishgarh, Goa, Gujarat, Haryana, Jharkhand, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Odhisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttarakhand, and West Bengal. Indian budgets used to make a distinction between planned and non-planned expenditure till 2013. The budgeted expenditure on any new project is kept under the "plan" portion of the budget if the project was started within the current five year plan[28]. Projects that started in a previous five year plan, but still continuing is entered into the "non-plan" section. Any

[28] It was not necessary that the project was a new project or scheme that started under the proposed budget of the current year.

government expenditure not started as part of the five year plans goes straight to the non-plan section from the beginning. This is an artificial distinction between expenditures (unlike the distinction between revenue and capital expenditures) and recently the Government of India has proposed scrapping this system of accounting (along with the dilution of the entire system of five year plans). We, therefore, use the total budgeted revenue expenditure figures (plan plus non-plan) instead of considering this distinction. The twelve categories of expenditure considered are – education, health, water supply, urban development, rural development, labor related expenditures, social security, irrigation, roads and bridges, administration and police. These twelve categories are the major expenditure categories devolved to the states under the federal system of the Indian Constitution. The dataset covers the period from 2000 to 2013. The source of the data is Reserve Bank of India's[29] yearly Study of State Finances. The nominal figures are adjusted for inflation using Consumer Price Index (base year 2000) figures available from the World Bank's World Development Indicators Database.

Time series data generally tends to exhibit nonstationarity and autoregression. Thus instead of analyzing the annual figures of Budget Estimates, we examine the annual percentage change of Budget Estimates. Thus, for each time period *t*, for the i^{th} category of expenditure we compute $(X_{it}–X_{it-1})/X_{it-1}$ and multiply it by 100 to express these as percentages. This *percentage-count measure* is the usual measure constructed by other studies of budgetary punctuation (for example Jones, Sulkin and Larsen 2003)[30]. These annual change scores are pooled by state and then by categories (separately) to give the

[29]The central bank of India.

[30] The other measure that could be constructed is the *percentage-percentage measure.* This measures is defined as the percentage change in relative importance of the *i*th category from time *t-1* to *t*, or $\left(\frac{X_{it}}{\sum X_{it}} - \frac{X_{it-1}}{\sum X_{it-1}}\right) / \frac{X_{it-1}}{\sum X_{it-1}}$.

datasets that we use for the analysis. Three states (Bihar, Uttar Pradesh, and Madhya Pradesh) were split in 2000-01 and thus three extra states were created from them (namely, Jharkhand, Uttaranchal/Uttarakhand, and Chhattishgarh). The 2001-02 figures for these states therefore show abnormal annual changes which are clearly not due to budgetary punctuation. Therefore we dropped these years for these states from the analysis. For all other states the change scores start from 2001.

The methods we use for the analysis are threefold. First we "eyeball" the distributions using the histograms for each category (pooled across all states by years) and for states (pooled across all categories by years) along with a normal distribution probability density function curve of the same mean and same variance. Distributions of variables that show punctuation are characterized by high peaks (overrepresentation of small changes), weak shoulder (underrepresentation of midrange changes) and fat tails (some massive changes) (see for example Breunig et. al. 2009) compared to normal distributions. In other words these distributions exhibit leptokurtic nature. The choice of bins (groupings of percentage changes) and hence smoothing is an important consideration while constructing histograms. Several methods are available from the statistics literature to construct optimal bin width and hence bin numbers (Izenman, 1991). Some of these methods implicitly assume a Gaussian distribution of the underlying data generating process and hence are not appropriate for my analysis. We use the Freedman-Diaconis rule of optimal bin width, $h = 2*IQR*N^{(-1/3)}$. IQR in this formula is the interquartile range of the data (75th percentile minus the 25th percentile) and N is the sample size.

The second method involves directly testing for normality. Within this second method, there are again two choices available - visual and statistical testing. The visual method involves creating Q-Q plots for the data series. If the observed data deviates from the diagonal line too much then we can suspect a violation of normality. The testing methods involve using explicit tests of normality like Kolmogorov-Smirnov, Shapiro-Wilk, Lilliefors or Anderson-Darling test (Razali and Wah, 2011). We use both methods as using only the tests are not recommended (D'Agostino, Belanger, and D'Agostino, 1990). The extant literature uses both Kolmogorov-Smirnov and Shapiro-Wilk tests (Breunig and Koski, 2006; Mortensen, 2005). The null hypothesis in both tests is that the data follows normal distribution. But the Kolmogorov-Smirnov test is considered to have lower power than the Shapiro-Wilk test, especially when leptokurtosis is involved which is the scenario with my data. Thus the statistics literature prefers the latter over the former when the mean and variance are not known. The null hypothesis in the Shapiro-Wilk test is that the data generating process is normal. If the null is true, the W statistic is equal to one, while if W is significantly smaller than one, then we can reject the null of normality. The Shapiro-Wilk test is also augmented with the Shapiro-Francia W' test.

For an initial inspection we pool the data for all the states and all categories in the sample and create combined series of annual changes. This gives me 2732 observations in total (after deleting missing values). Figure 4.1 shows the histogram of distribution created for this combined series. The rug on top of this histogram shows the frequency of each change score. The three figures, Fig 4.2, 4.3, and 4.4 shows the distribution of the percentage-count change scores for each of the states in my sample. The next set of

figures, Fig. 4.5 and 4.6 shows the distribution of the dependent variable for each of the twelve spending categories.

Next, we construct the Q-Normal plots for visually inspecting the deviation of the annual percentage changes of budgeted expenditures in state (all categories combined) and in each category (All states combined) separately. Given that our sample is chronologically not very long we refrain from constructing the plots for each category for each state separately. These figures are presented in the Appendix B as figures B.1 to B.5. Table 4.1 and Table 4.2 contain the descriptive statistics and the results of the formal tests of normality. For non-Gaussian distribution mean and variance is not very meaningful measures of descriptive statistics. Therefore, following the suggestions from the applied statistics literature and the standard practices in the punctuated equilibrium literature compute the Median, Interquartile Range, Kurtosis and L-Kurtosis. Standard Kurtosis measures are overly affected by large outliers. Our data is characterized by large outliers, hence we need some better measure of Kurtosis than the standard one. Fortunately, such measures (robust of the presence of outliers) are available in the form of L-Kurtosis measure (Hosking, 1990) and we present those numbers computed from the data. The columns S-F and S-W in Table 4.1 and Table 4.2 contain the value of the test statistics from these two tests and the p-value columns contain the p-values for each corresponding test statistic.

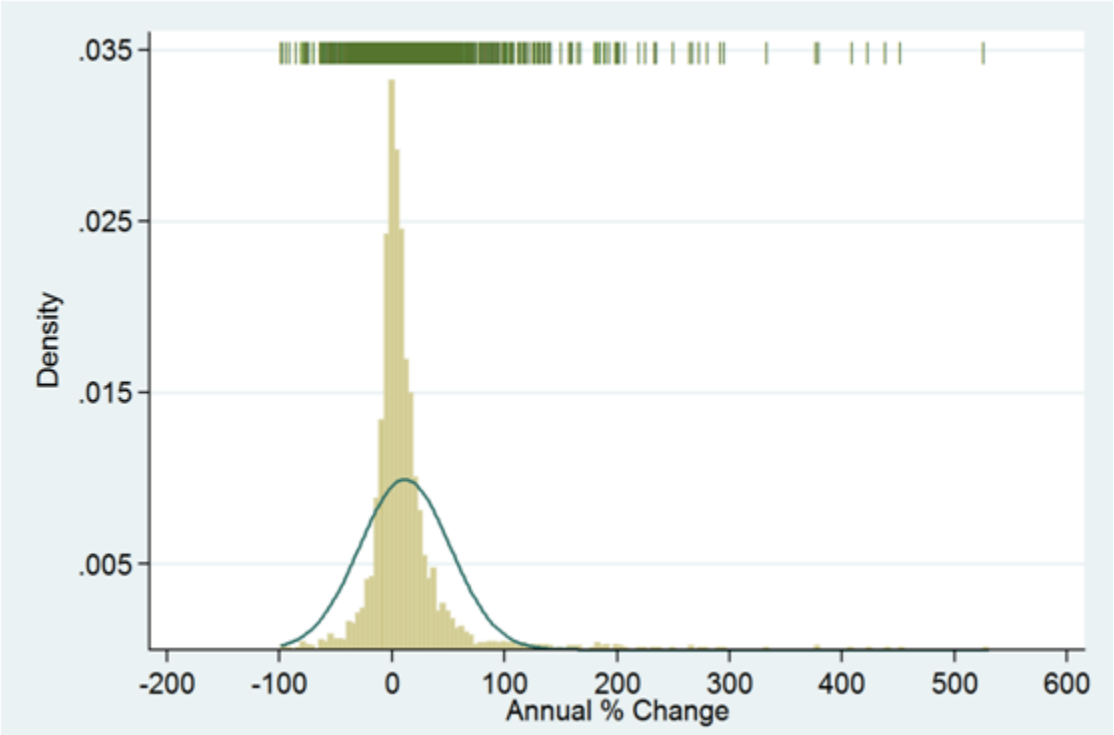


Figure 4.1: Distribution of Annual Percentage Changes of Budget Estimates, combined 2001-2013

4.4. Results and Discussion

Results of our analysis using the methodology explained in the previous section indicate a strong presence of budgetary punctuation in the budgets of the states of India. In Fig.4.1, we present the distribution of the annual percentage changes of budgeted expenditures in all categories for all states, for the entire sample period. The 'rug' above the histogram indicates the frequency of each observed percentage change values (measured along the horizontal axis). The continuous curve is indicative of a normal distribution with same mean and standard deviation. A simple visual inspection of this figure tells us that the distribution of changes in budgetary expenditure is not normal. Similar distribution of the aggregate data has been observed for other countries as well

(for example, Mortensen, 2005, p. 941 for Danish local budget; Breunig et. al. 2009, p. 9, for USA). The distribution shows classic signs of leptokurtosis. If the budget changes were normally distributed then we would see approximately around 68.26% of the observations to fall within one standard deviation of the mean. In our sample, 89.72% observations lie between plus and minus one standard deviation of the mean. On the other hand for a normal distribution only 0.26% of the observations should lie outside the range of plus and minus three standard deviations from the mean. However, in our sample around 1.79% of the observations lie outside this boundary. As a result there are relatively far less observations in the range of one standard deviation to three standard deviation. Breunig et. al. (2009) defines any change greater than 50% as "massive increases". In the present sample, 8.24% of the observations satisfy this criterion. Thus at a combined level the state budgetary changes in India shows severe leptokurtic behavior. In other words the budgeted expenditure changes at the state level in India are characterized by stability which is frequently interrupted by very large punctuations.

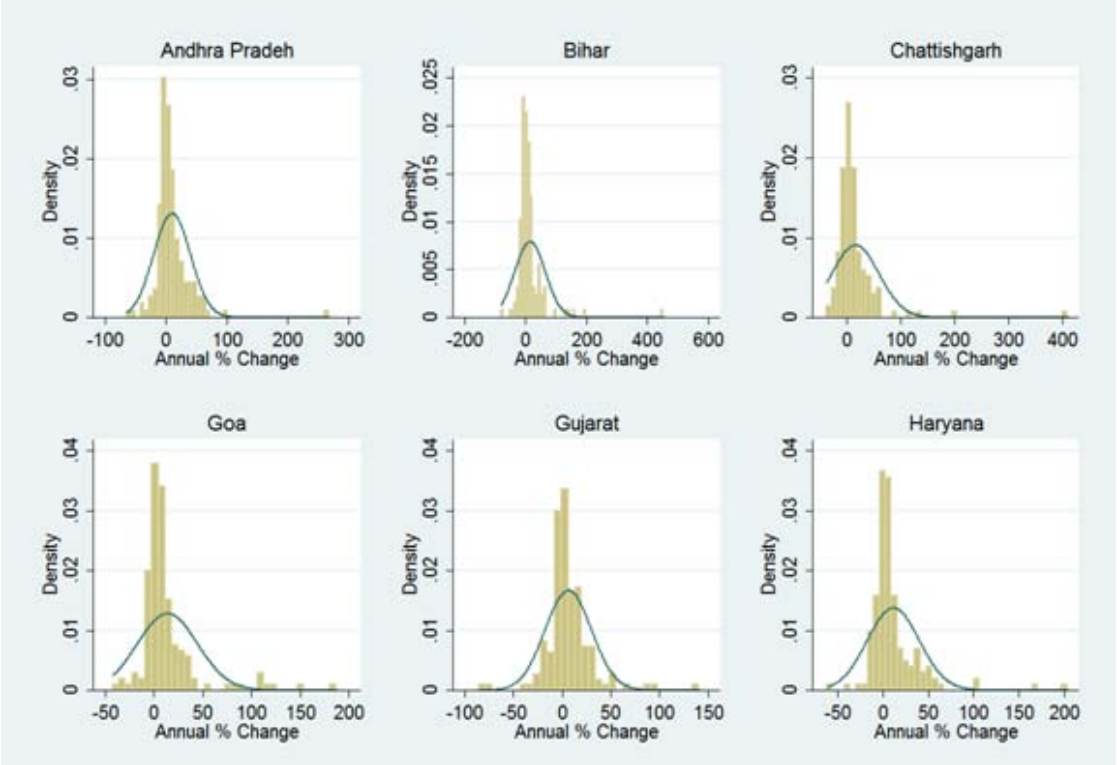


Figure 4.2: Distribution of Annual Percentage Changes of Budget Estimates (by State, 2001-2013)

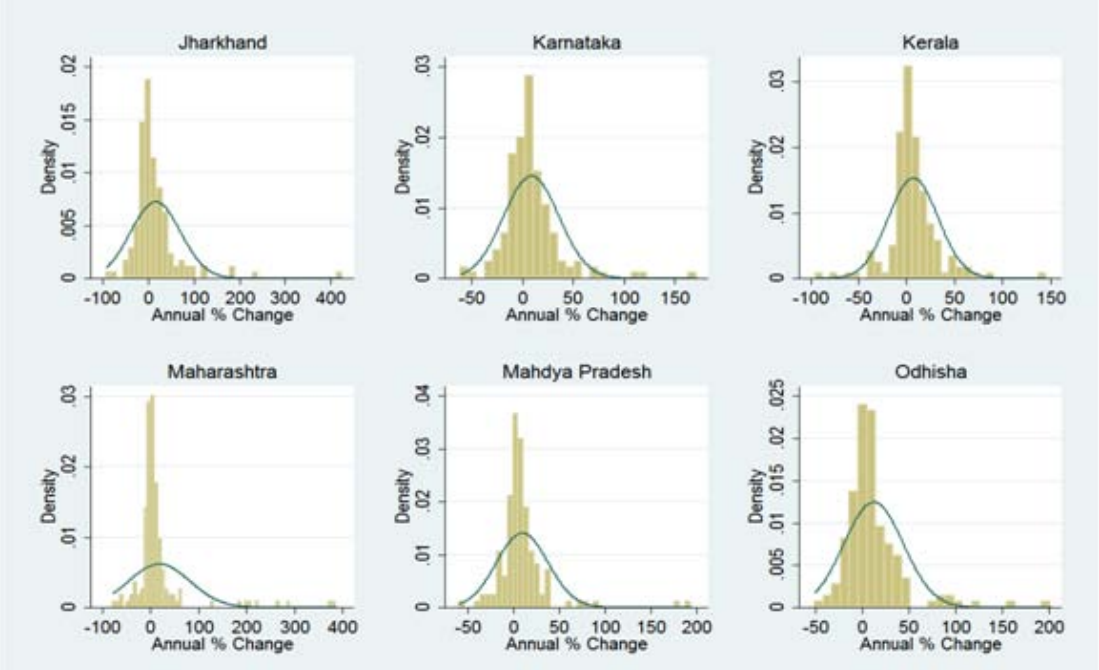


Figure 4.3: Distribution of Annual Percentage Changes of Budget Estimates (by State, 2001-2013)

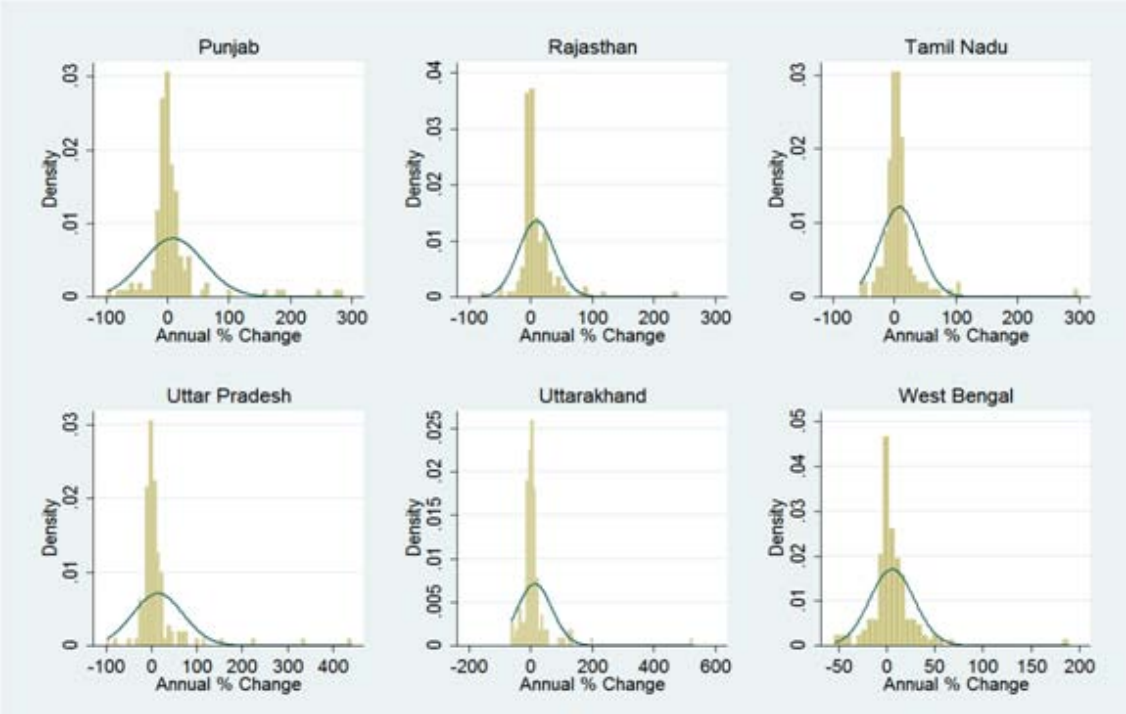


Figure 4.4: Distribution of Annual Percentage Changes of Budget Estimates (by State, 2001-2013)

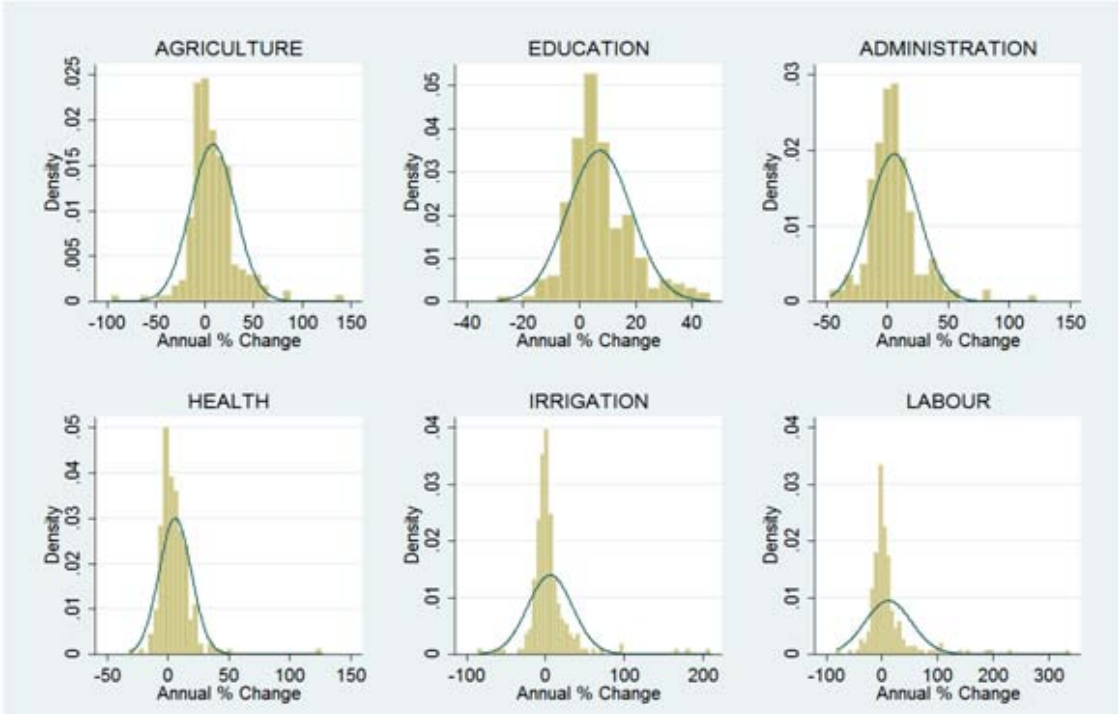


Figure 4.5: Distribution of Annual Percentage Changes of Budget Estimates (by Category, 2001-2013)

This aggregate picture may mask a lot of state to state and category specific variation in the pattern of the distribution of annual change. As the next level of exploration, we therefore, have plotted the distributions of the annual changes in budgeted expenditures for each state (all categories combined) and for each category (for all states combined). Figure 4.2 to 4.6 present these distributions.

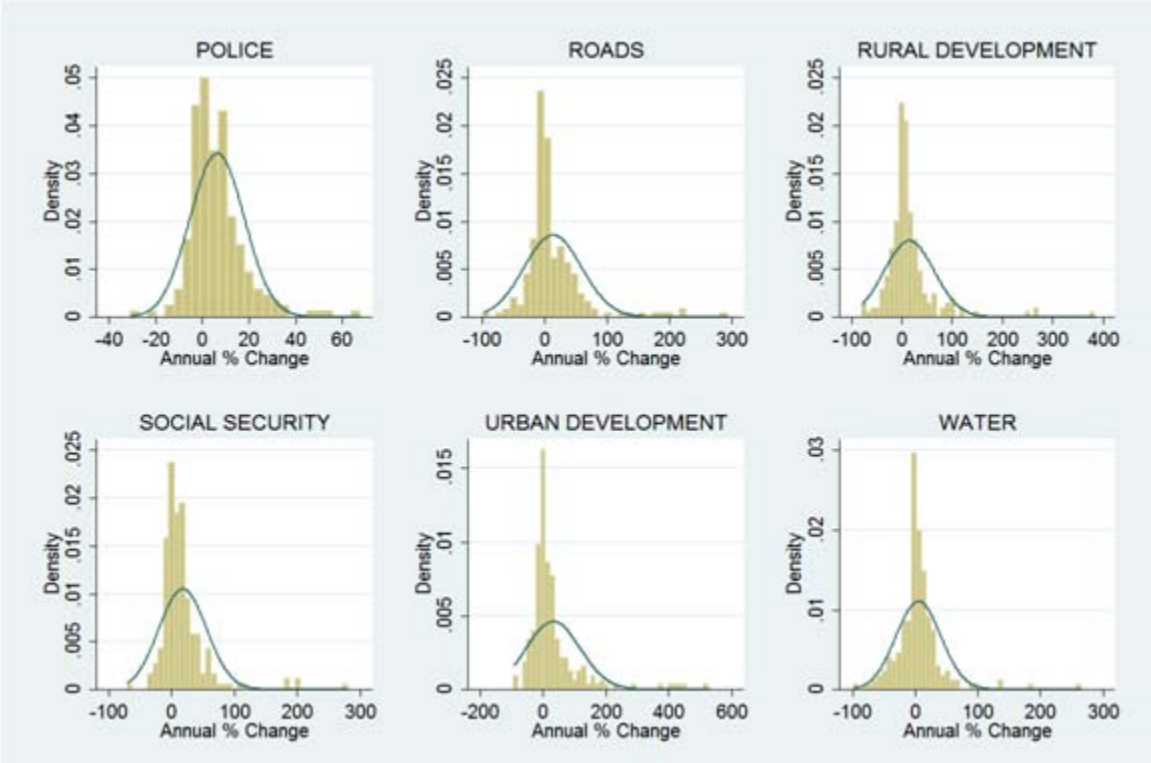


Figure 4.6: Distribution of Annual Percentage Changes of Budget Estimates (by Category, 2001-2013)

Figures 4.2 to 4.3 show that the punctuated nature of budgetary changes is not specific to any particular state of India. Some states (Goa, Odhisha, and West Bengal) may not have seen any reduction greater than 50 percent, but all states experience

increases greater than 50 percent quite frequently. Moreover, figures 4.5 and 4.6 show that almost all categories of expenditure exhibit characteristics of leptokurtic distribution. Thus the punctuated pattern of annual change is neither driven by any particular state nor by any particular category. However, as we will soon discuss there is considerable variability in the extent of punctuation for different categories of expenditures.

Table 4.1: Descriptive Statistics and Tests of Normality Results of Budget Changes in Each State, 2001-2013

State	Median	IQR	Kurtosis	L-Kurtosis	S-F	p value	S-W	p value
Andhra Pradesh	4.667	19.433	33.805	0.313	0.699	0.000	0.714	0.000
Bihar	5.332	22.972	42.879	0.411	0.546	0.000	0.561	0.000
Chhattishgarh	8.277	24.365	47.607	0.367	0.528	0.000	0.542	0.000
Goa	6.987	18.212	12.788	0.390	0.677	0.000	0.684	0.000
Gujarat	3.739	19.009	11.606	0.328	0.830	0.000	0.842	0.000
Haryana	4.880	17.461	19.278	0.359	0.692	0.000	0.703	0.000
Jharkhand	4.059	31.852	24.863	0.366	0.672	0.000	0.686	0.000
Karnataka	5.887	21.548	11.584	0.307	0.837	0.000	0.846	0.000
Kerala	4.567	20.855	8.874	0.328	0.874	0.000	0.885	0.000
Maharashtra	4.120	19.546	18.307	0.524	0.529	0.000	0.537	0.000
Madhya Pradesh	6.045	15.449	22.464	0.394	0.668	0.000	0.680	0.000
Odhisha	5.946	25.186	12.353	0.309	0.780	0.000	0.788	0.000
Punjab	0.343	19.419	17.315	0.492	0.604	0.000	0.612	0.000
Rajasthan	2.220	19.502	25.966	0.379	0.674	0.000	0.690	0.000
Tamil Nadu	4.775	17.689	39.609	0.403	0.626	0.000	0.641	0.000
Uttar Pradesh	2.093	19.601	32.283	0.497	0.503	0.000	0.517	0.000
Uttarakhand	4.211	21.193	51.163	0.474	0.498	0.000	0.513	0.000
West Bengal	2.752	15.209	24.423	0.342	0.761	0.000	0.775	0.000
Total	4.470	19.92	44.035	0.407	0.605	0.000	0.606	0.000

S-F: Shapiro-Francia, S-W: Shapiro-Wilk, IQR: Inter Quartile Range

To bolster these conclusions reached by a simple visual inspection of the data we have provided the relevant numerical measures that characterize the distributions and the

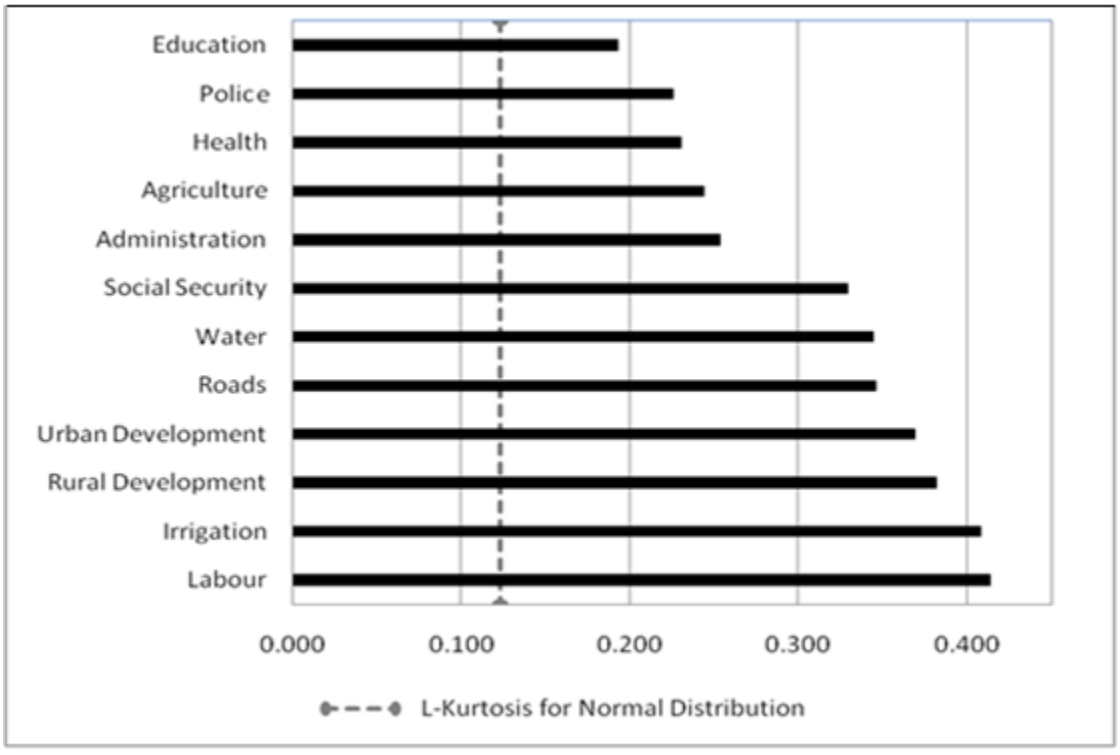
results of the formal tests of normality in tables 4.1 and 4.2. Once we leave the realm of Gaussian or Normal distribution the popular measures – mean and standard deviation – lose much of their sheen. Therefore, following the extant literature we have provided two other measures of central tendency and dispersion – the median and the interquartile range. Moreover, since the regular Kurtosis measure is not well behaved in the presence of outliers (which is the case with our sample), we have computed the L-kurtosis for the annual percentage changes – for each state (all categories combined) and for each category (all states combined). As can be seen from table 1, the overall distribution of budget changes in each state is characterized by leptokurtosis – L-Kurtosis values far higher than 0.12 which corresponds to a Normal distribution. However, the leptokurtosis is far less strong in categories of expenditure like Education, Health, and Police than in categories like Labor, Irrigation and Rural Development. This is even more starkly presented in Figure 4. The last four columns of table 4.1 and 4.2 present the results of the tests of Normality. As we can see from the associated p-values of each test, the null hypothesis of normal distribution can be easily rejected in each of them. Statistics literature argues that one should not only depend on the numerical tests for testing normality of any data series. Following this suggestion, we have created the Q-plots for each state and for each category (all states combined). These are presented in Appendix B. Combining these results and diagrams I can conclude that the budgetary changes in each state and in each category exhibits punctuations.

Table 4.2: Descriptive Statistics and Tests of Normality Results of Budget Changes in Each Expenditure Category, 2001-2013

Expenditure Categories	Median	IQR	Kurtosis	L-Kurtosis	S-F	p value	S-W	p value
Labor	2.167	20.959	23.571	0.414	0.622	0.000	0.631	0.000
Irrigation	1.937	15.238	23.743	0.408	0.652	0.000	0.661	0.000
Rural Development	6.369	28.248	21.870	0.382	0.681	0.000	0.689	0.000
Urban Development	8.231	43.911	14.928	0.369	0.667	0.000	0.671	0.000
Roads	2.532	33.137	13.445	0.346	0.749	0.000	0.755	0.000
Water	1.752	23.613	17.952	0.345	0.788	0.000	0.798	0.000
Social Security	10.070	25.506	19.203	0.329	0.691	0.000	0.699	0.000
Administration	4.211	19.186	8.522	0.254	0.906	0.000	0.912	0.000
Agriculture	5.536	23.414	9.125	0.244	0.897	0.000	0.906	0.000
Health	3.900	12.327	31.381	0.230	0.765	0.000	0.776	0.000
Police	4.978	11.533	8.070	0.225	0.894	0.000	0.900	0.000
Education	4.674	13.546	4.344	0.193	0.949	0.000	0.951	0.000

S-F: Shapiro-Francia, S-W: Shapiro-Wilk, IQR: Inter Quartile Range
(Ordered according to L-Kurtosis Value)

Figure 4.7: L-Kurtosis for All Expenditure Categories, All States combined, 2001-2013



Both table 4.2 and Fig. 4.7 show (and also the Fig. 4.5, and 4.6) that certain categories of expenditure exhibit more leptokurtic nature or punctuated nature than other categories. Education, Police, Health, Agriculture, and Administration shows lower values of L-Kurtosis compared to Labor, Irrigation, Rural Development and Urban Development. The top five categories in Fig. 4.7 constitute areas where the wage and salary component is very high. The employees in schools and colleges, police, hospitals and health centers, and government administration are organized into strong labor and employee unions. Expenditure on the category 'Agriculture' creates a strong vested interest group in rural sector which are crucial for electoral fortunes. On the other hand spending categories like Labor, Irrigation, Rural and Urban Development, although may be economically very important, but does not create well defined beneficiary groups. Most of these tasks are undertaken by private contractors under government tender which means the workers do not constitute strong labor unions either. However, due to changing natural fortunes of Monsoon (annual rainy season in India) flood and draught issues make spending categories like Irrigation hit the macro-political agenda at regular intervals which results in more punctuations in this type of categories. According to Baumgartner and Jones, such interest configurations results in more stasis in the former group of categories, while relatively more punctuations in the latter.

4.5. Are There Competing Explanations

Thus far we have shown that even being a developing country, far away from the sample of countries – both socially and economically – that has generally been subjected to punctuated equilibrium studies till now, Indian state budgets conform to the pattern exhibited and explained by Punctuated Equilibrium Theory. However, it is not necessary that large annual changes be indicative of bounded rationality and disproportionate information processing by the political system of the type that underlines the Punctuated Equilibrium Theory. Such large changes may simply be reactions of the budget officers (Finance Department Officials) to previous year's wrong forecasts. It might simply be the case that if for any category the gap between Revised Estimates and Budget Estimates of the immediately preceding year is large and positive (realized expenditure greater than what budgeted) then the officials allocate a larger sum for that category compared to last year's budget. Since Revised Estimates are results of *ex post* economic condition of the economy therefore, in this scenario budgetary punctuations can actually be explained by the economic condition of the previous year, rather than disproportionate information processing of the officials and policy makers.

Large punctuated changes may also be the result of political exigencies like state legislative elections. Sitting governments have clear objective of being reelected. The most prominent ways it can capture the imagination of the state citizens is by spending more during elections years (and may be one year prior to the election year). Thus the large changes in budgeted expenditure may be because of election years.

Just as sitting governments have interest of being reelected and thus may be found to spend more during election years, similarly, the opposition parties also make populist

promises of higher spending in several sectors during the political campaign. Thus if the opposition comes to power in a state election, the year following the state election may see large increases in budgeted expenditures. If the years around the state election years see large changes in budgetary allocations, then such changes are better explained by the political needs of the parties rather than bounded rationality of the budgetary decision makers.

Finally, large changes in Revenue Expenditure may be the result of large Capital Expenditures in the same sectors in a prior year. Additional capital expenditure in a previous year creates new employment and other avenues of expenditures which the Revenue Expenditure of subsequent years must account for. In such cases, the observed punctuated changes in the Revenue Expenditure would be the explained by the Capital Expenditure.

To test the importance of these counter explanations I estimate the following model.

$$y_{it} = \beta_0 + \beta_1 * election + \beta_1 * gap_{it-1} + \beta_1 * cap\_score_{it-1} + \varepsilon_{it}$$

Where the dependent variable is the change in budgetary expenditure for state *i* in year t. The first explanatory variable *election* is a dummy variable. We have tested two different versions of this variable. In the first version this variable is one for election years, and zero for every other year. In the second version this variable is one for the election years, the year preceding the election year and the year following the election year. *Gap* is the revised expenditure and budgeted expenditure gap of the previous year. The variable *cap_score* is the annual percentage change in capital expenditure in the same sector in the previous year. Not all capital expenditure figures were available and due to this data

limitation we have estimated the above model for Education, Health, Water Supply, Urban and Rural Development, General Government Administration and Irrigation. Once the models are estimated, we compute the residuals. If the residuals still exhibit leptokurtic distribution then we can conclude that these counter explanations are not valid. The models are estimated as fixed effect models. The results are presented in table 4.3 and 4.4.

Table 4.3: Fixed Effect Estimation Results

Dependent Variable	Education	Education	Health	Health	Urban Dev.	Urban Dev.	Water Supply	Water Supply
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Election Year Dummy	4.308		3.773		13.156		-5.845	
	(1.689)**		(1.601)***		(20.258)		(11.657)	
Election Year and one year on either side dummy		-1.252		0.779		35.297		7.611
		(1.5)		(1.369)		(17.080)**		(9.697)
Change in Capital Expenditure in previous year	-0.002	-0.002	0.005	0.005	0.0003	0.0003	-0.0005	-0.0008
	(.003)	(.003)	(0.006)	(0.006)	(0.0001)**	(0.0001)**	(0.003)	(0.003)
Revised Estimates-Budget Estimates Gap	.790	.796	0.791	0.781	0.478	0.466	1.316	1.321
	(.089)***	(.094)***	(0.855)***	(0.087)***	(0.142)**	(0.142)**	(0.22)***	(0.219)***
Overall R^2	.28	.25	.29	.27	.11	0.12	0.17	0.17

Standard errors in parenthesis.

Table 4.4: Fixed Effect Estimation Results (Cont.)

Dependent Variable	Rural Dev.	Rural Dev.	Government Administration	Government Administration	Irrigation	Irrigation
	(1)	(2)	(3)	(4)	(5)	(6)
Election Year Dummy	13.654		2.507		0.341	
	(8.281)		(3.285)		(3.055)	
Election Year and one year on either side		9.48		-0.602		-1.428
		(6.767)		(2.759)		(2.637)
Change in Capital Expenditure in previous year	-0.004	-0.003	-0.004	-0.004	0.008	0.015
	(0.005)	(0.005)	(0.002)	(0.002)	(0.032)	(0.033)
Revised Estimates-Budget Estimates Gap	1.117	1.167	1.145	1.135	0.987	.999
	(0.145)***	(0.143)***	(0.12)***	(0.121)***	(0.108)***	(0.11)***
Overall R^2	0.24	0.24	0.25	0.24	0.32	0.31

Standard errors in parenthesis.

The estimated models explain varied amounts of the total variation in the annual percentage change in budgetary expenditures. The variation is quite dramatic across different spending categories. On the one hand we have Education, Health and Irrigation where twenty five percent or more of the total overall variation is explained by the model. On the other we have Urban Development where this percentage comes down to around eleven. Although we have presented the standard errors in the parenthesis, but unless the residuals are proved to be normally distributed the tests of significance are meaningless. The gap between revised and budget estimates in the previous year seems to explain a large part of the explained variation. For every one percent increase in the gap, budgetary expenditure in the current year seem to increase by around 79 percentage points for Education and Health, 48 percentage points for Urban Development, and by more than 100 percentage points for Water Supply and Rural Development. Thus, forecast error in previous year seems to affect the budgetary changes to a large extent. It appears that in the sample, other than water supply, all types of expenditure increases in the election years. However, there is not much evidence to support the hypothesis that expenditure changes that much in the year preceding and following the state election.

The gap between the revised and budget estimates in the previous year seem to explain a substantial part of the explained variation in the annual budgetary change. However, what is more important is the distribution of the residuals once this effect is taken care off. In table 4.5 we present the L-kurtosis value of the residuals along with the Shapiro-Wilk and Shapiro-Francia tests of normality. The L-kurtosis values are still much higher than 0.12 which is the L-Kurtosis value of the normal distribution. Both the Shapiro-Wilk and Shapiro-Francia tests reject the null hypothesis of normality of the

residuals at least at five percent level of significance for each type of expenditure. Thus the residuals still exhibit leptokurtic distributions.

Table 4.5: Test of Normality Results for the Estimated Residuals

Residual of	Model	L-Kurtosis	S-F	p-value	S-W	p-value
Education	Model 1	0.232	0.8667	0	0.85625	0.00001
	Model 2	0.199	0.88358	0	0.87259	0.00001
Health	Model 1	0.164	0.98104	0.01118	0.98101	0.01268
	Model 2	0.166	0.97339	0.00106	0.97296	0.00147
Urban Development	Model 1	0.447	0.61023	0	0.59568	0.00001
	Model 2	0.411	0.62433	0	0.61045	0.00001
Water Supply	Model 1	0.398	0.45231	0	0.43546	0.00001
	Model 2	0.406	0.45246	0	0.4355	0.00001
Rural Development	Model 1	0.345	0.74425	0	0.73119	0.00001
	Model 2	0.335	0.73352	0	0.72014	0.00001
Administration	Model 1	0.225	0.91419	0	0.90735	0.00001
	Model 2	0.221	0.91978	0	0.91314	0.00001
Irrigation	Model 1	0.298	0.77749	0	0.76341	0.00001
	Model 2	0.293	0.7916	0	0.77830	0.00001

4.6. Conclusion

In this paper we set out to test the applicability of the Punctuated Equilibrium Theory of budgetary change using data from Indian state budgets. The results presented in this paper demonstrate that the annual budget changes in Indian States exhibit both stasis and punctuations. The distribution of these changes can easily be seen to be more leptokurtic than the Gaussian distribution. These findings are observed across states and across spending categories. The degree of punctuation (or leptokurtosis) is larger in spending categories where the beneficiaries are not well defined or formally organized in politically important interest groups. We also tested some alternative explanations to the

observed punctuated pattern of budgetary changes in the Indian state budgets. We found that forecast error correction explain a part of this pattern. However, even after accounting for the forecast error correction, we are still left with large residual leptokurtic variation in annual change in the budget. Thus the primary findings in this paper extend the existing literature on budgetary punctuation developed for countries like USA, UK, Germany, Denmark and France to India. Therefore, it seems that punctuated equilibrium theory can describe the behavior of budgetary policy even in developing parliamentary democracies like India.

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Appendix A: Definitions and Source of Variables for Tax Interaction Analysis

Variable	Definition	Source
EATR	Effective Average Tax Rate. Computed following the definition of Devereux and Griffith (1998).	Computed from tax rate data collected from AEI tax database. Other required variables in the computation were collected from World Bank Open Database.
STR	Top statutory tax rate.	AEI tax database for tax rates.
Dependency Ratio	Ratio of young (less than 14 years) and old (older than 65 years) people to working age (14-64 years) population.	World Bank Open Database and World Bank Development Indicator Database.
Population Density	Population per sq. KM.	World Bank Open Database and World Bank Development Indicator Database.
Government Expenditure	Government final consumption expenditure.	World Bank Open Database and World Bank Development Indicator Database.
Openness	Total of export and import as a percentage of GDP.	World Bank Open Database and World Bank Development Indicator Database.
Per capita real GDP	Real GDP (in 2005 US$) divided by total population	World Bank Open Database and World Bank Development Indicator Database.
Urban Population	Proportion of population living in urban areas.	World Bank Open Database and World Bank Development Indicator Database.
Rent from Natural Resources	Rent from Natural Resources as percentage of GDP.	World Bank Open Database and World Bank Development Indicator Database.

Appendix B: Q-Normal Plots of Annual Changes in Budget Estimates

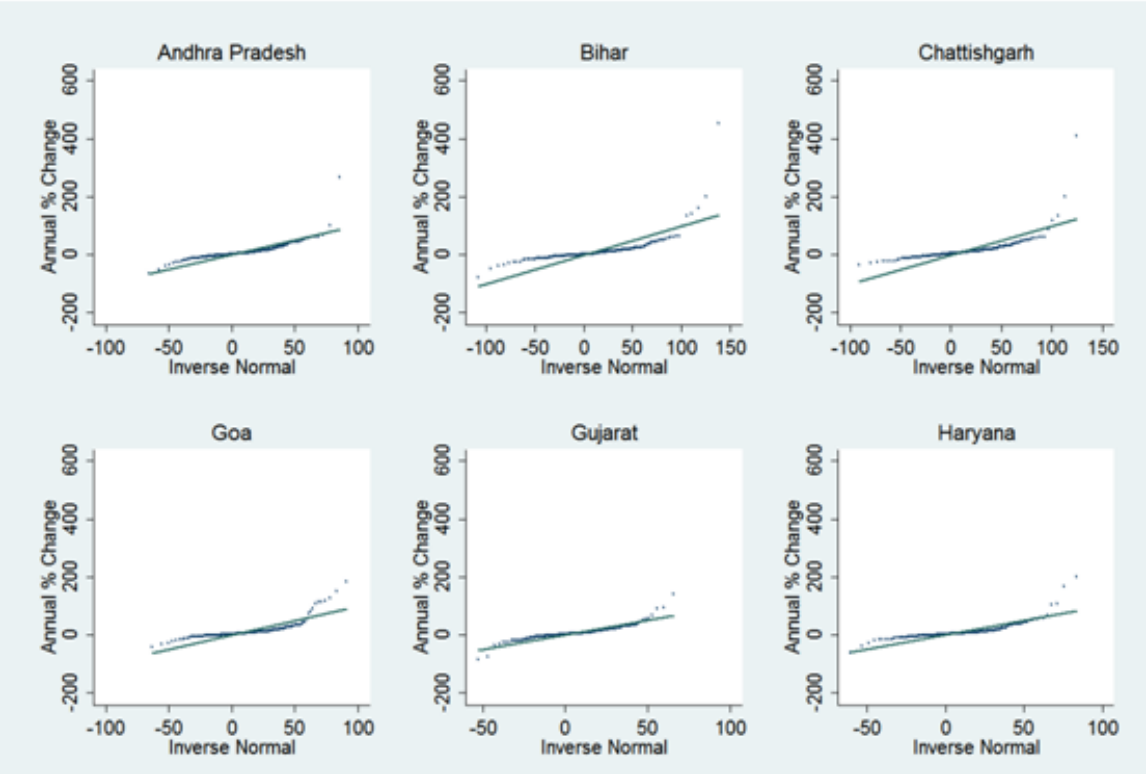

Figure B.1: Q-Normal Plot of Annual Change in budget Estimates (By State, 2001-2013)

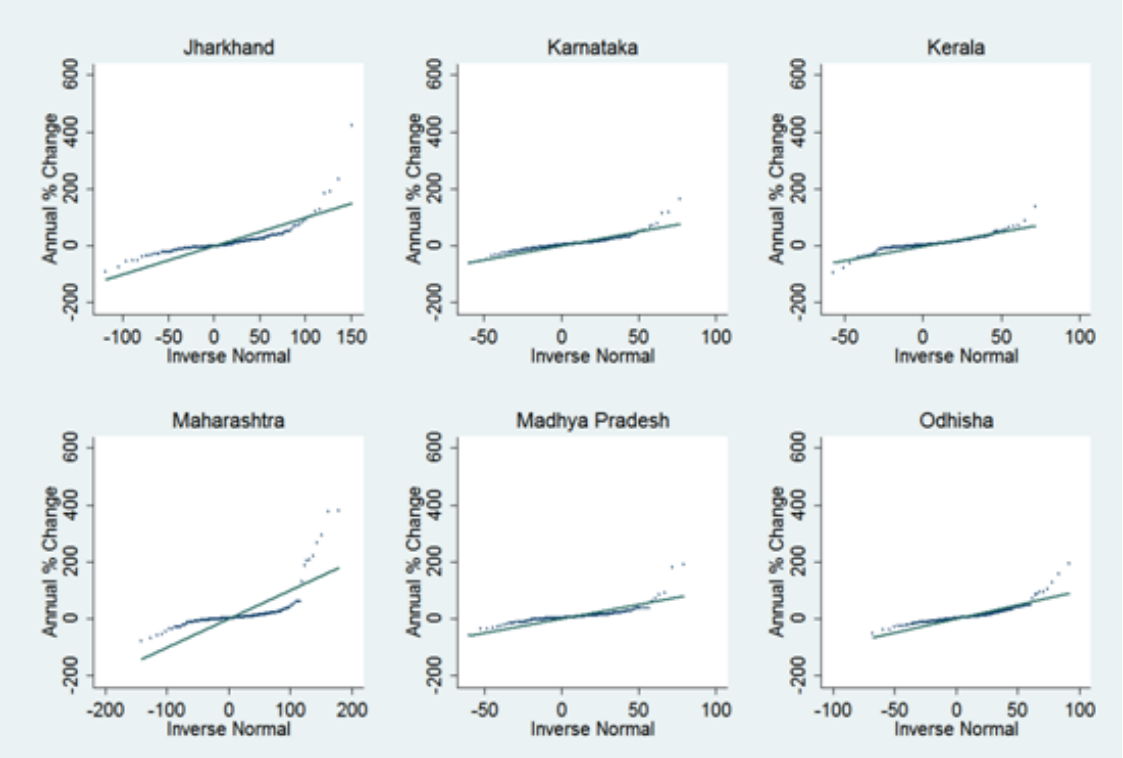

Figure B.2: Q-Normal Plot of Annual Change in budget Estimates (By State, 2001-2013)

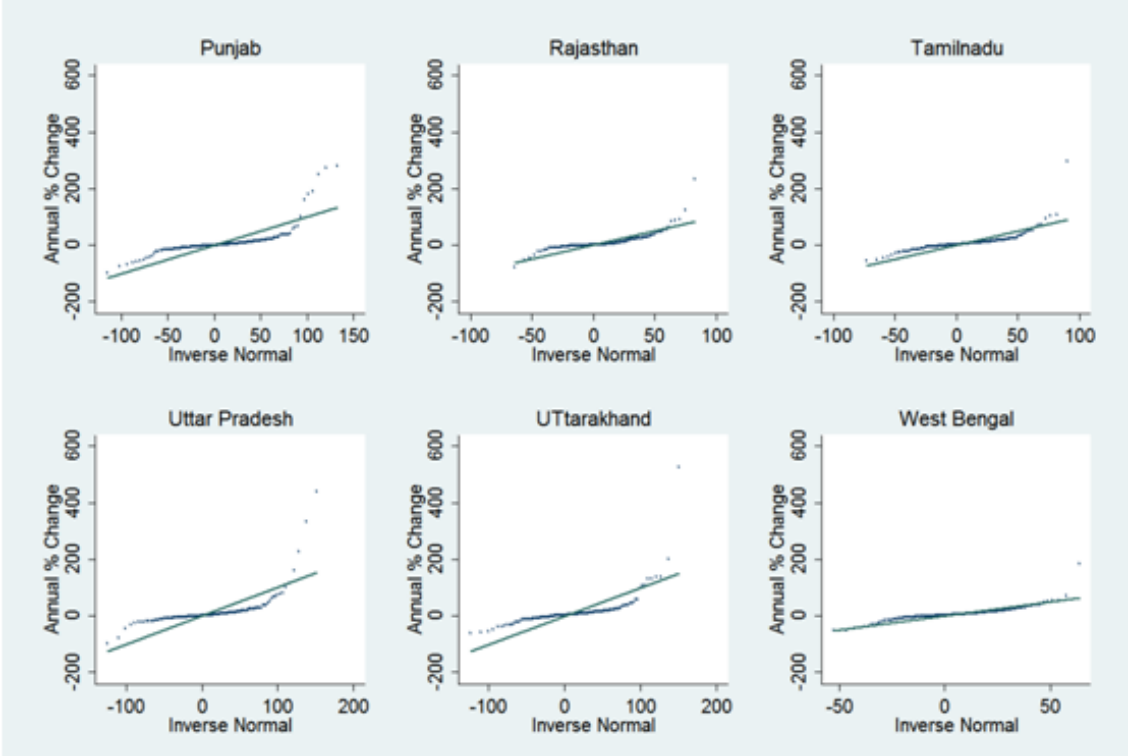

Figure B3: Q-Normal Plot of Annual Change in budget Estimates (By State, 2001-2013)

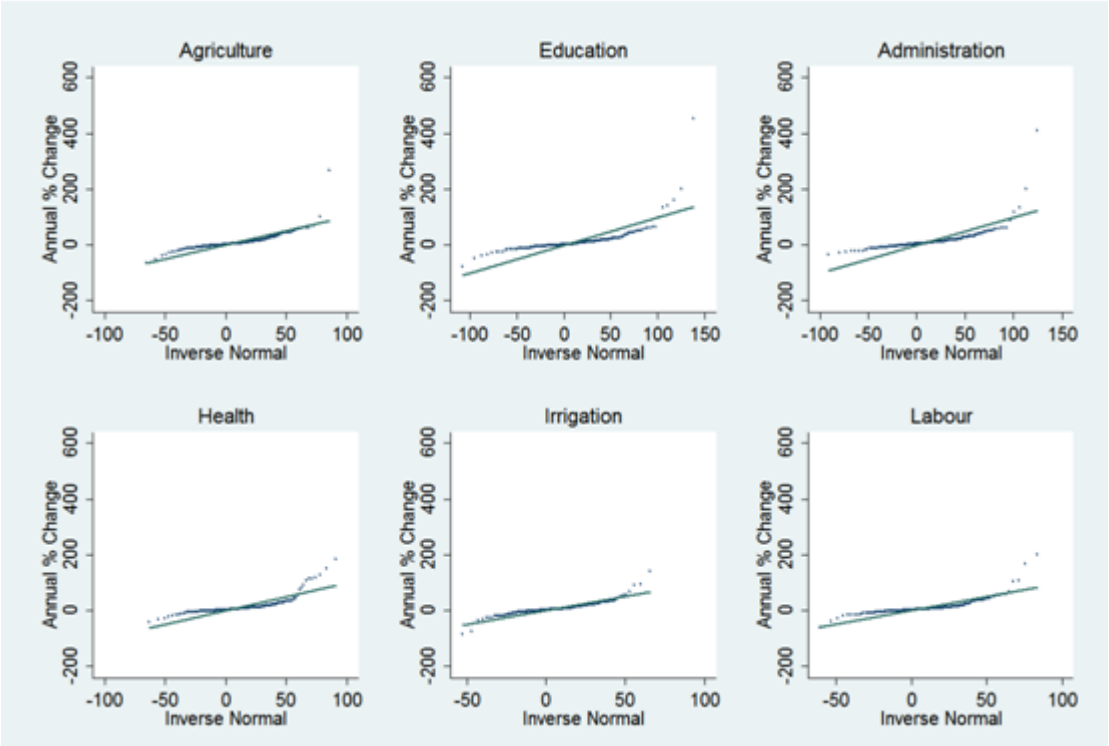

Figure B.4: Q-Normal Plot of Annual Change in Budget Estimates (By Category, 2001-2013)

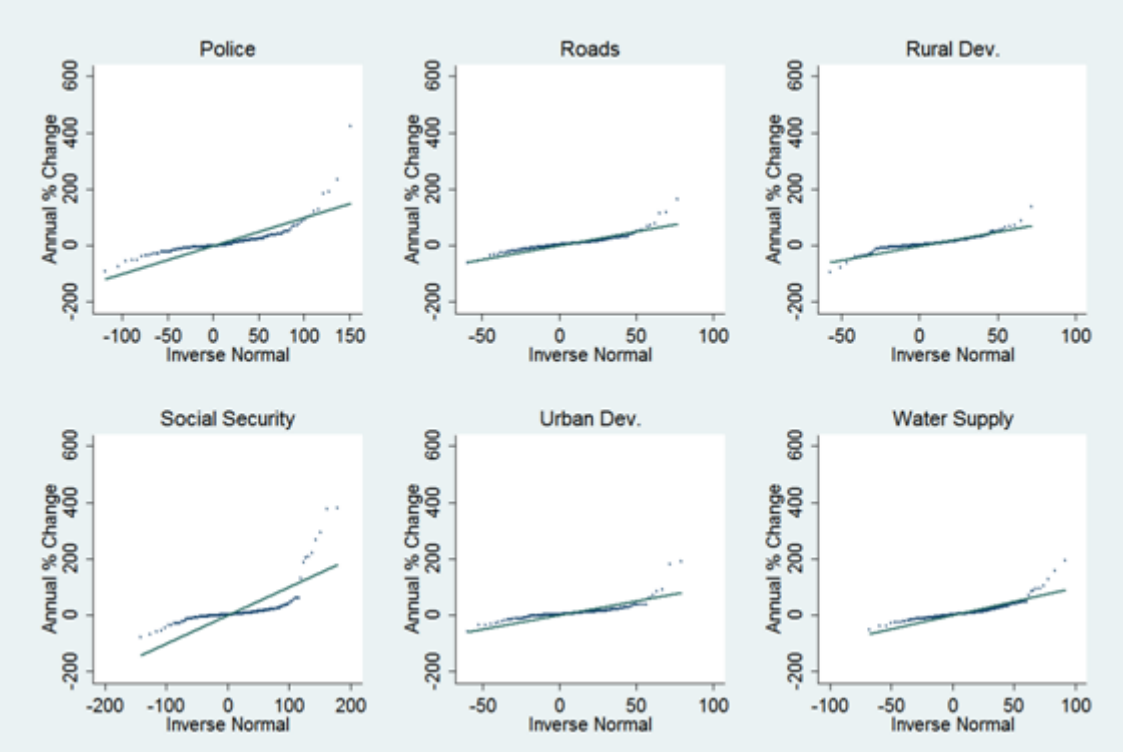

Figure B.5: Q-Normal Plot of Annual Change in Budget Estimates (By Category, 2001-2013)