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Tax Smoothing in a Financially Repressed Economy: Evidence from India

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Abstract

India has a long history of running fiscal deficits. Two broad considerations motivate a government to run a deficit: tax smoothing and tax tilting. This paper tests a version of Barro's tax-smoothing model, using Indian data for the period 1951-52 to 1996-97. The empirical results indicate that the central government of India has tax-smoothed, while the regional governments of India have not. The paper also finds evidence of tax tilting, reflected in financial repression, which has led to the accumulation of excessive public liabilities.

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Why do governments run fiscal deficits? One rationale for fiscal imbalances is to minimize the distortionary effects of levying non-lump-sum taxes by spreading the burden of these taxes over time. This concept of tax smoothing, first introduced by Barro (1979), is now well established in the literature on fiscal policy. Tax smoothing has the normative implication that budget imbalances can be optimal fiscal policy responses to anticipated future events. For example, a government anticipating an increase in its own expenditure can minimize the distortionary effects of raising the finance for that expenditure if it brings forward some of the associated tax increase and runs a budget surplus (or a smaller deficit) in the current period.

Budget imbalances are pervasive in developing countries and India has a long history of large fiscal deficits. Few studies, however, ask whether this outcome is consistent with optimal fiscal policy. This paper tests for the presence of tax-smoothing behavior in India, using a vector autoregressive approach and data for 1951-52 to 1996-97.

The paper finds that the intertemporal tax-smoothing model is successful in explaining the behavior of the fiscal deficits of the Indian central government, yet the states do not tax-smooth in the presence of temporary shocks to expenditure. The results also confirm previous findings that financial repression has traditionally made a significant contribution to Indian net revenues. A likely explanation for the concurrence of tax smoothing and financial repression is the inability of the Indian central government to meet its fiscal objectives from conventional (tax and nontax) revenue sources.

I. INTRODUCTION

Why do governments run fiscal deficits? One rationale for the existence of fiscal imbalances is to minimize the distortionary effects of levying nonlump-sum taxes (for a given present value of tax collections), by spreading the burden of these taxes over time. That is, if taxes are distorting decisions to work or consume, then the timing of taxes will matter. This concept of tax smoothing, first introduced by Barro (1979), is now well established in the literature on fiscal policy.[2] Tax smoothing has the normative implication that budget imbalances can be optimal fiscal policy responses to anticipated future events. In particular, a government anticipating an increase in its own expenditure can minimize the distortionary effects of raising the finance for that expenditure if it brings forward some of the associated tax increase and runs a budget surplus (or a smaller deficit) in the current period. Similarly, a budget deficit (or a smaller surplus) is optimal if the government anticipates future falls in its expenditure.

Optimizing governments will not alter tax rates contemporaneously with temporary fluctuations in expenditures, but, given that the marginal cost of taxation rises with the tax rate, then the total cost of revenue-raising will be minimized if the planned tax rate is constant (smoothed) over time. A smooth tax rate implies that temporary shocks to government spending and output yield fiscal imbalances, and provides a rationale for the issuance of public debt. In this sense, the tax-smoothing hypothesis is the fiscal analogue of Campbell's (1987) consumption-smoothing model.

Budget imbalances are pervasive in developing countries. Yet there are few studies asking whether this outcome is consistent with optimal fiscal policy. In this paper, we examine five decades of time series data for India, both at the national and subnational levels of government, to answer this question. Like most developing countries, India has had a long history of running fiscal deficits, which continues to be the key macroeconomic issue in India even today. However, unlike many developing countries, India's fiscal record is of special interest as its very large fiscal deficits have not been accompanied by adverse macroeconomic developments, such as high inflation or periods of negative growth in per capita income.[3] An

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[2]As noted by Barro (1979, 1995), for a given amount of public expenditure, if taxes are lump sum and the other conditions for Ricardian equivalence are present, there are no real effects from shifts between taxes and the issuance of public debt as modes of financing fiscal imbalances. However, if taxes are distorting then the timing of taxes will matter, and it will be desirable to smooth tax rates over time, financing any temporary difference between public revenue and public expenditure by creating public debt.

[3]Indian output levels and growth rates could have been mismeasured in recent years. This is because India's system of national accounts appears to grossly underestimate economic activity in the informal manufacturing and nongovernment services sectors of the economy, both of which have expanded strongly since the early 1990s (IMF (1997)).

important reason for India to run deficits has been the ready availability of resources garnered from financial repression as, until recently, interest rates were kept artificially low.

In this paper we test for the presence of tax-smoothing behavior in India, using data from 1951-52 to 1996-97 and the vector autoregressive approach of Huang and Lin (1993) and Ghosh (1995). This approach is an improvement on early (random walk) tests of tax-smoothing, due to its focus on the optimal path of the budget surplus, rather than on tax rates themselves. This is important as even if tax rates are deemed to follow a random walk, tax smoothing is only one among many potential explanations for the unpredictability of changes in tax rates. In contrast, the approach adopted here allows us to generate a time series for the optimal budget surplus, assuming that the government tax smooths, and then compare that to the actual surplus—if smoothing is to hold, any differences between the two series should be quite small. Our approach also readily allows for nontax-smoothing causes of fiscal deficits to be controlled for, enabling a more accurate test of the tax-smoothing model. Finally, the case of India is of interest as it is both the first developing country and first federal country to be examined for the presence of tax smoothing using the above technique.

We find that the intertemporal tax-smoothing model is successful in explaining the behavior of the fiscal deficits of the Indian central government, and so the center does tax smooth in the presence of temporary shocks to expenditure. In contrast to the center, the volatility of state taxes has been excessive relative to those which would be consistent with minimizing the utility losses arising from the levying of distortionary taxes, and so the states do not tax smooth. Our results also confirm previous findings that financial repression has traditionally made a significant contribution to Indian net revenues. A likely explanation of the concurrence of both our tax smoothing and financial repression is the inability of the Indian central government to meet its fiscal objectives from conventional (tax and nontax) revenue sources. This unwillingness to garner sufficient revenue from conventional sources makes it more likely that the government: (i) borrows in response to shocks to government spending (which is behavior consistent with tax smoothing); and (ii) taxes financial intermediation (by such means as financial repression) as an important source of net revenue. In this context, we find that the financial-repression-induced overborrowing of the 1970s and 1980s has yielded a stock of liabilities for the center which deviates significantly from the stock of liabilities generated from the series of optimal (tax-smoothing) fiscal deficits. As at 1996-97, the center's actual stock of public liabilities was about 18 percent of GDP higher than it would have been under optimal tax smoothing (down from a peak of over 25 percent of GDP in the late 1980s), implying that fiscal surpluses (or at least smaller deficits) will need to be run in the future to ensure intertemporal solvency.

The paper is organized as follows. Section II summarizes the previous literature on tax smoothing and optimal fiscal policy, while Section III presents an overview of the main features of Indian public finance. Key issues involved in testing for optimal tax smoothing are outlined in Section IV, followed by a description of the econometric methodology and the data in Sections V and VI, respectively. The results from tests of tax smoothing (Section VII) and fiscal sustainability (Section VIII) are then presented, followed by a short conclusion.

II. Previous Literature on Tax Smoothing

There is a growing empirical literature that tests the implications of the tax smoothing hypothesis. The first of these implications is that the tax rate, if optimally smoothed, will follow a random walk since an optimally set tax rate would only change upon the arrival of new information. Numerous studies have checked the time series properties of average tax rates, with the most common finding being that tax rates do follow a random walk.[4] However, this is quite a weak test of the tax smoothing hypothesis, as the finding of a unit root in tax rates is consistent with a variety of explanations of tax determination.[5]

Tax smoothing also has implications for the debt to GNP ratio, and these can be easily checked. Barro's (1979) seminal paper found that U.S. government debt did increase during temporary surges in government spending (such as wars) and recessions. Later, Barro (1986, 1987) examined long-run U.S. and British data, and found that the debt to GNP ratios for both countries generally increased during wars, decreased during peacetime, and fluctuated over the business cycle. All of this is consistent with tax smoothing although, once again, the power of this test to reject the tax smoothing hypothesis is likely to be quite low.[6]

More recent research has focussed on the question of whether the budget surplus is informative about future changes in government spending. The information content of the budget surplus has been tested by Huang and Lin (1993) and by Ghosh (1995). Both studies examine the time series properties of North American data using vector autoregression techniques, and find that increases in the budget surplus signal future increases in government expenditure, which is evidence in favor of tax smoothing. In contrast, the two most recent studies of tax smoothing reject the hypothesis. Olekalns (1997) found for Australian post-World War II data that the budget surplus has been too volatile to be fully consistent with tax smoothing. Olekalns and Crosby (1998) examine long-run data, covering all of the twentieth and some of the nineteenth centuries, for Australia, the United Kingdom, and the United States. They find that tax smoothing is accepted only for the United States.

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[4]An example is the study by Barro (1981), who found that the average tax rate in the United States between 1884-1979 followed a random walk. Other studies include: Kingston and Layton (1986) for Australia; Gupta (1992) for Canada; Barro (1986), Sahasakul (1986), and Barro (1987) for the United Kingdom; and Trehan and Walsh (1988), and Huang and Lin (1993) for the United States.

[5]For example, taxes could follow a random walk if rates were determined by a random political process, or if the budget surplus was adjusted to help satisfy a country's external constraint. See Section V, and Ghosh (1995) for a more detailed discussion.

[6]See also Cooley and Ohanian (1997), who found that the abandonment of tax smoothing by the British government during World War II contributed significantly to a reduction in post-War welfare. Ohanian (1997) has a similar finding for the implications of fiscal policy in the United States during the balanced-budget Korean War period.

While Barro (1979) only analyzed the debt of the national (central) government, the fiscal actions of subnational governments also have important macroeconomic implications, particularly in federal countries such as India. All of the above studies focus on national governments—there are few studies that examine tax-smoothing by subnational governments. Horrigan (1986) follows Barro (1979) in finding support for the tax-smoothing model when examining U.S. federal debt, but rejects the smoothing hypothesis for state and local debt. Similarly, Strazicich (1997) finds that the hypothesis of tax smoothing is not rejected for federal governments in the United States and Canada or for the Canadian provinces, but is rejected for the states of the United States, as state tax rates do not follow a random walk. Both Horrigan (1986) and Strazicich (1996, 1997) argue that the mobility of taxable factors precludes subnational governments from intertemporally smoothing taxation—this is not a constraint typically faced by national governments (Benjamin and Kochin (1982)). They also claim that the balanced budget rules in United States arose in response to the greater inter-jurisdictional mobility of U.S. factors of production.[7] In this context, the relative cross-state immobility of factors in India should allow Indian states to more readily smooth taxes (see Cashin and Sahay (1995)).

III. Indian Public Finance

There is a long-standing vertical fiscal imbalance between the revenue-raising and expenditure responsibilities of the central and state governments of India. While the central government generates about two-thirds of general government (center and state) taxation revenue, it undertakes only about half of general government expenditure.[8] To resolve this imbalance, the Indian Constitution provides for a complex mechanism of intergovernmental transfers from the center to the states. The Indian system of intergovernmental transfers has three basic components. First, the Constitution provides for the establishment every five years of a Finance Commission, which awards transfers from the center to the states in the form of shared taxes and grants, traditionally to cover gaps between state current revenue and expenditure. Second, untied and tied center-state transfers are authorized by the Planning Commission, which formulates India's five-year development plans. These transfers are

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[7]While balanced budget rules may in principle preclude tax smoothing by subnational governments, tax smoothing could still occur in such an environment if the national government uses its revenue sharing powers as a countercyclical revenue source for subnational governments (Horrigan (1986)).

[8]See Sury (1992), Joshi and Little (1994), Chopra et al. (1995), Hemming et al. (1997), Shome (1997), and Rao (1997) for detailed discussions of India's federal structure and public finance.

traditionally for capital expenditures by the states. Third, the center provides loans to finance the fiscal deficits of the states.[9]

Center-state government relations in India are marked by the assignment of certain expenditure tasks to the states (chiefly in the areas of agriculture, education, health and poverty alleviation), and the right to collect taxes on particular sectors of the economy (agriculture and professional services) and impose sales taxes. States also receive fixed shares of central government (income tax and excise duty) revenues, as well as center-state grants and loans. The central government receives the bulk of its taxation revenue from excise and customs duties, while current expenditure of the center is dominated by interest payments, defense spending, grants to the states and public subsidies (Chopra et al. (1995)).

Notwithstanding the above-mentioned intergovernmental transfers, gaps between revenue and expenditure can remain at both tiers of government, which are bridged by borrowing. According to the Indian Constitution, the center can borrow both domestically and overseas, while the states are prohibited from borrowing abroad and require the center's consent to borrow domestically if the state has outstanding liabilities to the central government (Buiter and Patel (1993)). In practice, state governments frequently borrow to cover fiscal imbalances remaining after intergovernmental transfers, borrowing chiefly from the central government and from the domestic loan market. The major domestic lenders are public sector financial institutions, which (particularly prior to 1993) were required by the central bank to hold state government securities at below-market rates of interest to satisfy statutory liquidity requirements (see Hemming, Mates and Potter (1997)).[10] [11]

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[9]The percentage share of total grants sourced from each component is currently about 55 percent (Finance Commission), 40 percent (Planning Commission) and 5 percent (deficit financing)—of the total transfers distributed, loans comprise about 75 percent and grants 25 percent (Hemming, Mates and Potter (1997), IMF (1997)).

[10]For details on the public finances of an important state, see the World Bank's (1997) report on Andhra Pradesh.

[11]About 70 percent of the financing for the states' gross fiscal deficit is through loans from the central government, with part of these loans (block plan loans and nonplan loans against state small savings collections) available at less than market terms. The other 30 percent of deficit financing is through either loans raised from the market (the size of which are determined administratively by the Government of India and the Reserve Bank of India, given prevailing statutory liquidity requirements) and through state-level employee funds (such as state provident funds), with the latter at significantly less than market rates of interest (IMF (1997)). Through its control of the size of market borrowing of the states, the central government effectively sets the limits on the states' fiscal deficits.

A. Indian Fiscal Outcomes

Figure 1a plots the fiscal position (gross fiscal deficit) of the Indian central government (CENGFD) and of the states (STGFD) between 1951-52 and 1996-97, where the gross fiscal deficit of each tier of government is the excess of aggregate disbursements (net of recovery of loans and advances) over receipts (revenue receipts, including external grants, plus nondebt capital receipts of government).[12] The fiscal deficits of the center can be financed by borrowing externally or domestically (chiefly through the issuance of public debt), and states' deficits are funded by issuing debt in domestic markets and borrowing from the central government (see Section VI and Appendix I for further details). Figure 1a reveals that fiscal deficits (as a percent of GDP) have been large and persistent for the Indian central government, and can be characterized as growing during the 1950s, 1960s and 1980s, and contracting during the 1970s and 1990s. However, the fiscal consolidation occurring at the national level in the 1990s has not been reflected in reduced deficits for the states, which have remained at about 3 percent of GDP since the mid-1950s.

The center's growing fiscal deficits of the 1980s imply future budget surpluses under tax smoothing. In contrast, there appears little evidence of tax smoothing for the states, as their budget deficits have remained relatively constant (Figure 1a).[13] In addition, rather than being set to smooth the tax rate, state revenue rose in tandem with state expenditure over the period (Figure 1b).

The balance of payments crisis of 1991 resulted in the near-exhaustion of India's foreign exchange reserves, largely caused by the withdrawal of foreign-currency deposits by nonresident Indians. While the trigger for the crisis lay in domestic political difficulties and the Persian Gulf war, concern over the sustainability of Indian fiscal policy, due to rising debt and debt servicing, was the root cause of the crisis (see Chopra et al. (1995) for details). Prior to the crisis, India financed its fiscal deficits largely through financial repression, with high reserve deposit requirements and statutory liquidity ratios inducing commercial banks to hold below-market-yielding public debt. Following the liberalization of the financial system which accompanied the commencement of an adjustment program with the International Monetary Fund, both center and state governments have increasingly had to borrow at close to market rates of interest. This shift to market borrowing in the context of high primary deficits has resulted in a sharp increase in the government interest bill. For example, central government

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[12]See Saibaba and Sarangi (1997) for a discussion of the concept of gross fiscal deficit and other issues in Indian public finance. Appendix I has a detailed description of the variables discussed in this Section.

[13]Statutory grants to the states (to cover any deficits on current operations) and periodic debt write-offs have reduced the incentive for individual states to boost their own revenue-raising and lower their deficits (see IMF (1997)).

interest payments rose by almost ½ percentage point of GDP between 1990-91 and 1996-97, even though the center's liabilities fell by over 6 percentage points of GDP over the same period.

Figure 1b illustrates that even inclusive of intergovernmental grants and sharing of central taxes, state expenditure (STEXP) exceeds state revenue (STREV). Central government liabilities (CENLIAB) doubled as a percentage of GDP over the 37-year period, while state liabilities (STLIAB, inclusive of borrowings from the central government) have remained relatively constant at about 20 percent of GDP since the early 1960s (Figure 1c).[14] Similarly, there has been little increase in either the states' share of central taxation (STSHARE) or grants to the states (GRANTS) since the early 1980s (Figure 1d). For the first time since the mid-1970s, new loans (LOANS) to the states fell below 2 percent of GDP in the mid-1990s. In addition, loan repayments to the center from the states (REPAY) have fallen sharply from their peak of the early 1970s, due in part to loan rescheduling (see IMF (1996) for further details).[15]

B. Indian Financial Repression

As in many developing countries, governments in India have found it difficult to satisfy their intertemporal budget constraint with conventional revenue and borrowings of the type discussed above. In addition to market borrowing and intergovernmental transfers as components of deficit financing, both tiers of government have also typically made recourse to the implicit taxation of financial intermediation, using quasi-fiscal activities such as seigniorage and financial repression as sources of fiscal revenue and reduced interest costs, respectively.[16]

Seigniorage, which is the purchasing power over real goods and services which comes about due to a central bank's monopoly over the issuance of reserve money (issuing currency and providing noninterest earning bank reserves through cash reserve deposits held at the central bank), is typically passed on to the government either through central bank profits or via no- (or low-) interest loans to the government. Seigniorage taxes (defined as the change in reserve money as a share of GDP) were an important component of Indian taxation over the period 1960-61 to 1994-95, on average representing about 1.5 percent of GDP

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[14]While the debt burden of the states has remained relatively constant, the burden of interest payments as a share of revenue receipts (that is, current revenue) has risen from an average of about 11 percent in the latter half of the 1980s to almost 17 percent in 1996-97 (Reserve Bank of India 1997).

[15]In turn, the states have typically relied on hikes in tax rates (rather than broadening of tax bases) for greater net revenue, along with cuts to capital and social sector expenditure (see IMF (1997)).

[16]See Joshi and Little (1994, 1996) for a description of India's financial system at the time of the 1991 external crisis.

Figure 1. Indian Fiscal Outcomes, Central and State Governments, 1951-52 to 1996-97
(In percent of GDP)

Figure 1a

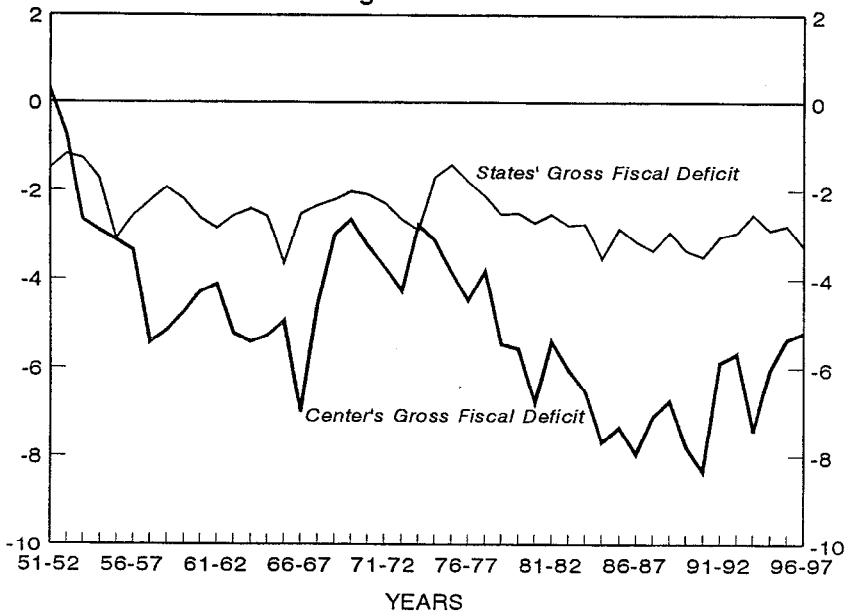


Figure 1b

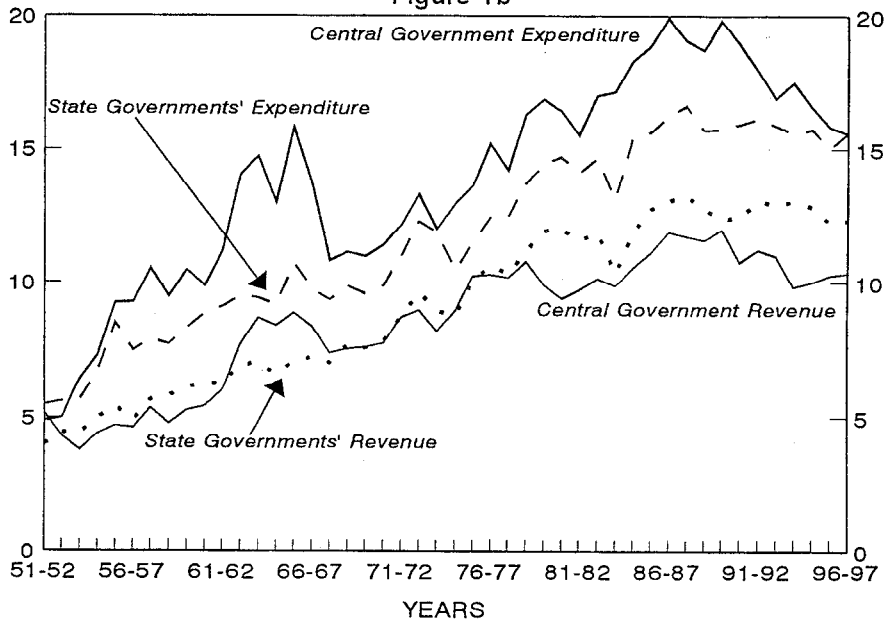


Figure 1c

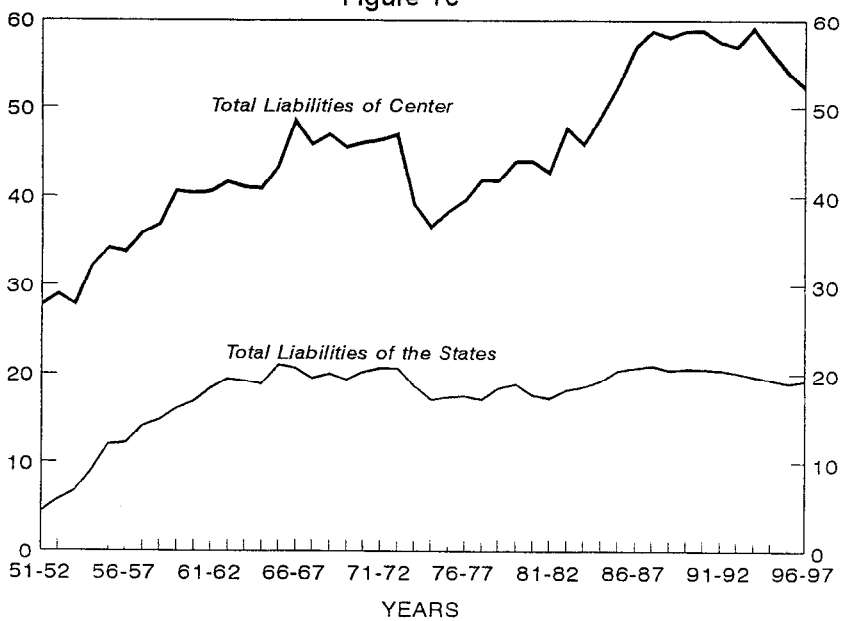
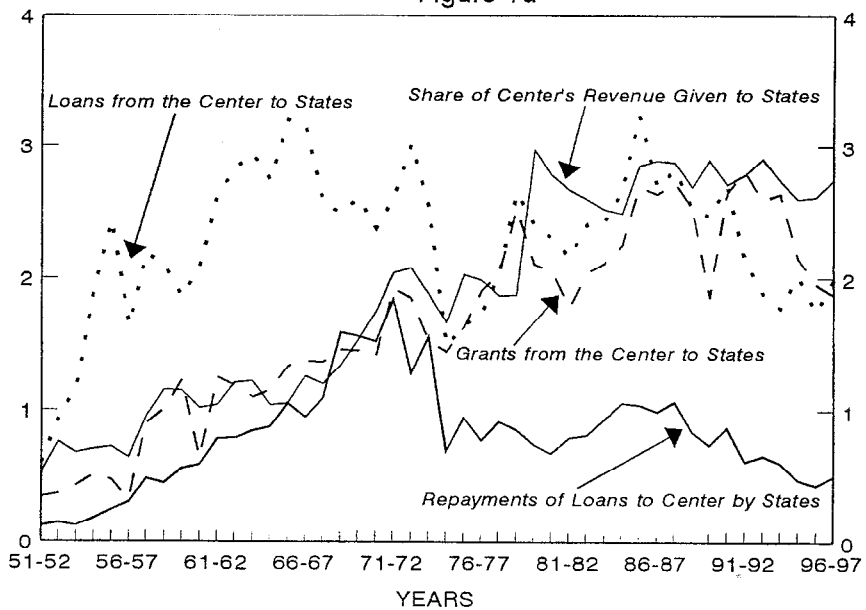


Figure 1d



Source: Government of India, *Report on Currency and Finance* (various issues); IMF, *IFS* (various issues); IMF staff estimates. See Appendix for data sources and definition.

per annum. Similarly, Fischer (1982) calculated that annual average Indian seigniorage revenues amounted to about 1 percent of GNP between 1960-76, or about 10 percent of government revenue. Click (1998) has also recently calculated that annual average Indian seigniorage revenues over the period 1971-90 were about 1.7 percent of GDP, or about 12 percent of government spending.[17]

The Indian cash reserve ratio (CRR, which requires banks to hold part of their deposits in the form of cash balances at the central bank) has historically ranged between 4-7 percent of bank deposits, yet was steadily raised to 15 percent by the late 1980s to bolster demand for reserve money. Similarly, the statutory liquidity requirement (SLR, which requires banks to hold a share of their asset portfolio in government securities at below-market rates of interest) was raised from about 20 percent of deposits in the early 1960s to 38.5 percent in the early 1990s. Both requirements enabled the government to garner about half of all credit extended by the banking system between the early-1960s and early-1990s, with banks investing in assets (consistent with CRR and SLR requirements) that barely covered the cost of funds (see Joshi and Little (1996), IMF (1996, 1997)). Currently, as a share of bank deposits, the CRR and SLR stand at 10.5 and 25 percent, respectively.

As noted above, financial repression in the Indian context traditionally involved: (i) domestic borrowing by government at below-market interest rates, intermediated by a network of publicly-controlled banks and financial institutions, which were required to hold public debt (due to high reserve and liquidity requirements) at interest rates below those that would be required to voluntarily acquire the debt; and (ii) financial intermediaries setting loan rates on private domestic credit which differed from the exchange-rate adjusted world interest rate (these typically involved nominal ceilings on institutional interest rates to limit competition from the private sector for the pool of loanable funds).[18] Indian governments have also required their public financial institutions to undertake additional quasi-fiscal operations, involving activities such as: the promotion of subsidized credit to priority areas

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[17]Fry (1997) also found that annual seigniorage revenue averaged 2.0 percent of GDP (or 14.7 percent of government revenue) between 1979-93.

[18]Annual average revenue from financial repression in India has been estimated by Giovannini and de Melo (1993) at a sizeable 2.86 percent of GDP and over 22 percent of government revenue (excluding revenue from financial repression) for the period 1980-85. Following the technique of Giovannini and de Melo (1993), Fry et al. (1996) found that the implicit subsidy to private sector borrowing (through nominal interest rate ceilings) from Indian financial repression averaged 0.83 percent of GDP (or 6.1 percent of government revenue) between 1979-93; data was unavailable to calculate the subsidy on government debt.

of the private sector (such as agriculture and small-scale manufacturing), the setting of credit ceilings and floors, exchange rate guarantees, loan rate ceilings, and loan guarantees.[19]

India has a low level of public saving relative to other developing countries, and has experienced a steady decline in public saving over the past two decades both for central and state governments (Mühleisen (1997)). Previous work examining the sustainability of India's path of fiscal imbalances found that a continuation of the trend to growing fiscal deficits during the 1980s was unsustainable, and that there was little scope for seigniorage revenues to fill the fiscal gap (see Chelliah (1991), Buiter and Patel (1992, 1993)). In addition, these studies argued that the positive value of India's primary fiscal deficit was inconsistent with a shrinking present discounted value of the debt stock; that is, with nominal interest rates above the GDP growth rate, primary surpluses (which were not forthcoming) were required to stabilize the debt-to-GDP ratio.

IV. Testing the Tax-Smoothing Hypothesis

The tax-smoothing model assumes that, in the absence of a first-best system of lump-sum taxes, the government seeks to minimize the welfare losses arising from its choice of tax rate. These losses are assumed to be an increasing, convex and time invariant function of the average tax rate. The government's ability to minimize the tax-induced distortions is conditioned by its adherence to the intertemporal budget constraint, which requires the present value of tax receipts to be sufficient to cover all current and future government spending together with the government's initial debt. In order to meet the intertemporal budget constraint, taxes cannot remain invariant to changes in either current or expected future expenditure. However, welfare losses will be minimized if, in response to newly acquired information indicating a future change in government expenditure, the government smooths the implied tax change over time.

Following the presentation of Barro (1979), Ghosh (1995), and Olekalns (1997), the optimal budget surplus at time t (sur_t^*) is given by

$$sur_t^* = \sum_{i=1}^{\infty} R^i E(\Delta g_{t+i} | I_t) \qquad (1)$$

where it is assumed that the government's subjective discount rate that reflects preference for current taxation over future taxation, β, equals the real interest cost of servicing the government's debt, R; the expectations operator is E, the information set available to the

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[19]However, the liberalization of India's financial sector in the 1990s has reduced the impact of many of these quasi-fiscal activities, with (for example) exchange guarantees being transferred to the Government of India from the central bank, reserve requirements on commercial banks being reduced, and many of the restrictions on the setting of commercial bank interest rates being removed (see Joshi and Little (1996), IMF (1996, 1997)).

government at time t is I_t, Δ is the first difference operator, and g_t is (exogenously-given) government outlays, G_t, normalized by the level of output, Y_t.[20]

A. Implications of the Tax-Smoothing Hypothesis

Equation (1) states that the optimally-chosen budget surplus is a linear function of expected future changes to government expenditure. The implication of an expected decline in government expenditure is that the government will reduce its budget surplus (possibly running a budget deficit), so that the tax reduction can be smoothed over time. An increase in the budget surplus is a signal that the government is anticipating an increase in its expenditure and is seeking to smooth the tax increase. The government's behavior is analogous to that of a consumer in consumption-smoothing models, who adjusts savings based on the expectation of future "rainy days" (see Campbell (1987)).[21]

A testable implication of the tax-smoothing hypothesis is that the optimal tax rate only changes if new information concerning government expenditure arrives (Ghosh (1995)). Accordingly, under rational expectations tax changes should not be forecastable, and so should follow a random walk.

Two further testable implications of the tax-smoothing hypothesis arise from equation (1). First, analogous to Campbell's (1987) consumption-smoothing hypothesis, the budget surplus should Granger-cause (help predict) changes in government spending. This will be true whenever the government has better information about the future path of its expenditure (through news of political or other events) than is contained in past values of the expenditure series (Ghosh (1995)). Under the null hypothesis that equation (1) holds, and so the budget surplus equals the discounted value of future changes in government expenditure (given the government's information set), then the surplus should take into account this additional information and so Granger-cause changes in government spending. The second testable implication of equation (1) is that the smoothed budget surplus should be stationary. Assuming that g_t is $I(1)$, then Δg_t will be $I(0)$; since under the null hypothesis the actual (tax-smoothed) budget surplus is the discounted sum of Δg_t (see equation (1)), then the smoothed budget surplus will also be $I(0)$.

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[20]When the rate of real output growth, n, is positive, the effective interest rate faced by the government ($R^{-1} \equiv (1+r)/(1+n)$) will be smaller than the actual market interest rate, $(1+r)$, where r is the assumed (constant) real rate of interest.

[21]Bohn (1990) and Barro (1995) consider a stochastic version of Barro's (1979) deterministic model, where a government manages its debt to smooth taxes over time and states of nature.

B. Why Run Deficits? Separating Tax Smoothing and Tax Tilting

There are two broad considerations motivating a government to run a budget deficit: tax tilting and tax smoothing. The analysis, up to this point, has assumed that only considerations of future changes to government expenditure (that is, tax smoothing) motivate the government to run either a budget deficit or a budget surplus. However, other intertemporal incentives for running unbalanced budgets exist. Even if we assume that government spending as a share of GDP will remain constant into the future (in which case there would be no need for tax smoothing), if the government's discount rate, β, differs from the effective interest rate, R, then the optimal tax rate will be affected by the government's desire to engage in tax tilting. As noted by Ghosh (1995), the relationship between β and R is given by $\gamma=[(1-(R/\beta)R)/(1-R)]$, where the tax-tilting parameter, γ, accounts for the fact that the optimal tax rate incorporates incentives for the government to defer taxes or enlarge surpluses, depending on the relationship between β and R. That is, when $\beta \neq R$ ($\gamma \neq 1$), the government's optimal tax profile will be "tilted". Tax tilting results in a bias towards either budget deficits or budget surpluses, which are created in a manner consistent with intertemporal solvency. For example, if $\beta<R$ ($\gamma<1$), the government's incentive is to shift taxes into the future, run fiscal deficits, increase its current level of liabilities and then gradually raise taxes over time. Such a government has a relatively high discount rate, and would choose to have a low tax rate in the present period, but would raise taxes over time to service its accumulating stock of debt. Conversely, if $\beta > R$, the government has an incentive to bring tax increases forward, run fiscal surpluses, build up its stock of assets and then gradually lower taxes over time.[22]

Since tax tilting has implications for the budget surplus that are entirely distinct from tax smoothing, it is important to ensure that the optimal surplus derived from equation (1) is compared to only that component of the budget surplus that relates to tax smoothing, and not to the actual budget surplus (which potentially includes both tax smoothing and tax tilting components).[23] This requires that tax tilting be filtered from the surplus according to

$$sur_t^{sm} = \gamma^{-1}\tau_t - g_t - (r-n)d_t \qquad (2)$$

where d_t is the stock of debt (liabilities) in period t, D_t, normalized by the level of output, Y_t; and τ_t is the average rate of tax at time t.

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[22]Tax tilting could occur, for example, if the current government is unsure of its reelection prospects and therefore favors higher current debt levels than are implied by tax smoothing, in order to exert an influence of the future spending activities of rival political parties who assume office (Alesina and Perotti (1995) and Olekalns (1997)). See Ghosh (1995) for a discussion of tax tilting.

[23]The tax-tilting (nonstationary) component of the actual fiscal surplus is removed to construct the tax-smoothing (stationary) component of the fiscal surplus. Beyond our desire to focus on tax smoothing, this is necessary to ensure the validity of standard statistical inference techniques, which will be used for hypothesis testing in Sections VII and VIII below.

Equation (2) measures the tax-smoothing component of the actual budget surplus; when $R>\beta$ (and $\gamma<1$), the tax-smoothing surplus sur_t^{sm} will be larger than the measured budget surplus, since the incentive is for the government to defer tax collections into the future (and so run a budget deficit in the present on tax-tilting grounds). Given that τ_t and $[g_t+(r-n)d_t]$ are both $I(1)$ variables, then the tilting parameter, γ^{-1}, is the cointegrating parameter from a regression of $[g_t+(r-n)d_t]$ on τ_t.[24] Our focus in this paper is on the tax-smoothing component of budget surpluses, because without an explicit model of intergenerational welfare it is not possible to decide whether deferring/bringing forward tax collections (that is, tax tilting) is desirable. However, as long as the government's objective function involves the minimization of the distortionary costs of taxation (which are assumed to rise quadratically with τ_t), then there will be avoidable deadweight costs from a failure to tax smooth (Ghosh 1995).

V. Econometric Methodology

The estimation and testing procedure is carried out in four steps. The first step is to obtain an estimate of the tilting parameter, γ^{-1}, in order to construct the stationary, tax-smoothing component of the fiscal balance by removing from the data the nonstationary component of the fiscal balance that is associated with tax tilting. Given that τ_t and $[g_t+(r-n)d_t]$ are both $I(1)$ variables, then this estimate of γ^{-1} can be obtained from equation (2), as the cointegrating parameter from a regression of $[g_t+(r-n)d_t]$ on τ_t. This relationship is best estimated using the Phillips-Hanson (1990) fully modified (FM) method, which yields an asymptotically correct variance-covariance estimator in the presence of serial correlation and endogeneity.[25] As noted above, it is important to obtain an accurate variance-covariance estimator, to ensure the accuracy of hypothesis tests used later. Finally, the actual (tax-smoothing) component of the fiscal balance, sur_t^{sm}, is defined by the residuals of the

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[24]When calculating the surplus, r and n are set equal to their respective average values. One of the advantages of doing so is to eliminate another possible source of tilting, involving changing the time path of taxation in response to deviations of the effective interest rate away from its permanent value. Obstfeld and Rogoff (1996, Chapter 2) discuss the same point, but in relation to private savings behavior.

[25]A correction for serial correlation and endogeneity is needed because while sur_t^{sm} is $I(0)$ it is not iid, as sur_t will be endogenous to g_t and will most likely be correlated with sur_{t-1}.

cointegrated regression of equation (2), and to confirm the regression is indeed cointegrated, the Phillips-Ouliaris (1990) residual-based cointegration test was employed.[26]

The second step is to calculate the optimal tax-smoothing component of the budget surplus. The derivation of the optimal budget surplus requires a measure of anticipated future changes to government expenditure. Following Campbell and Shiller (1987), an obvious way of deriving such a measure is to exploit the fact that under the null hypothesis that tax smoothing is valid, the budget surplus contains all the known information about future changes to the government's spending plans.[27] Because the smoothed budget surplus (sur_t^{sm}) responds to expected future changes in government spending, it is a relevant information variable to forecast future changes in government expenditure. In addition, we can exploit the information concerning future expenditure plans contained in current and lagged values of Δg_t. This means that forecasts of future changes to government spending can be recovered from a bivariate VAR in Δg_t and sur_t^{sm}. The VAR can be written as

$$v_t = A_1 v_{t-1} + A_2 v_{t-2} + \ldots + A_q v_{t-q} + e_t \tag{3}$$

where v_t is the $2x1$ vector of variables $(\Delta g_t, sur_t^{sm})'$, e_t is a $2x1$ vector of residuals, and each coefficient matrix, A_ω is $2x2$. It is more convenient to write the VAR in first order form

$$\begin{bmatrix} v_t \\ v_{t-1} \\ . \\ . \\ v_{t-q+1} \end{bmatrix} = \begin{bmatrix} A_1 & A_2 & . & . & . & . & A_q \\ I_2 & 0_2 & 0_2 & . & . & . & 0_2 \\ 0_2 & I_2 & 0_2 & 0_2 & . & . & 0_2 \\ . & . & . & . & . & . & . \\ 0_2 & . & . & . & . & I_2 & 0_2 \end{bmatrix} \begin{bmatrix} v_{t-1} \\ v_{t-2} \\ . \\ . \\ v_{t-q} \end{bmatrix} + \begin{bmatrix} I_2 \\ 0_2 \\ . \\ . \\ 0_2 \end{bmatrix} e_t$$

where I_2 is a $2x2$ identity matrix and 0_2 is a $2x2$ matrix of zeroes. The first order system can be written more compactly as

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[26] As the series for sur_t^{sm} is constructed from the residuals of the cointegrating regression of equation (2), then sur_t^{sm} will contain some estimation error because the exact value of γ^{-1} is unknown, and has to be estimated. This additional uncertainty needs to be taken into account in undertaking the test of whether equation (2) is a cointegrated regression, and so the Phillips-Ouliaris critical values (which have a larger critical region over which the null hypothesis cannot be rejected) are used to determine if sur_t^{sm} is $I(0)$.

[27] Accordingly, the budget surplus should Granger-cause (help predict) future changes in government expenditure.

$$Q_t = AQ_{t-1} + We_t \tag{4}$$

where $Q_t \equiv (v_t \; v_{t-1} \; . \; . \; . \; v_{t-q+1})'$ and $W \equiv (I_2 \; 0_2 \; 0_2 \; . \; . \; . \; 0_2)'$. Given that the expected value of the VAR innovations is zero, forecasts of the variables I periods into the future are given by

$$E(Q_{t+i}|I_t) = A^i Q_t \tag{5}$$

and the anticipated changes to government expenditure can be recovered from

$$E(\Delta g_{t+i}|I_t) = A^i z' Q_t \tag{6}$$

where z' is a vector of length $2q$ defined by $z' \equiv (1\ 0\ 0\ .\ .\ .\ 0)$.

Equations (1) and (6) imply that the optimal tax-smoothing surplus is

$$sur_t^{*sm} = \sum_{i=1}^{\infty} R^i A^i z' Q_t. \tag{7}$$

Assuming that the infinite sum on the right-hand side of equation (1) converges and that the variables in the VAR system of equation (4) are stationary (as discussed in Section IV), then the infinite sum in equation (7) converges to

$$sur_t^{*sm} = z'RA[I-RA]^{-1}Q_t \tag{8}$$

where I is an identity matrix. The validity of the tax-smoothing hypothesis can then be tested by comparing the values for the optimal tax-smoothing budget surplus derived from equation (8) to the values for the actual tax-smoothing budget surplus derived from equation (2).

The third step is to conduct a series of hypothesis tests to evaluate the tax-smoothing model. The first of these is simply to test the prediction of the tax-smoothing model that movements in the tax rate follow a random walk. The second test examines whether the smoothed budget surplus is stationary. The third test is to examine whether, as predicted by the model, the government's budget surplus Granger causes (helps predict) changes in government expenditure. For example, given that a fiscal deficit exists, this should signal that a decrease in future government expenditure is expected. The final test examines whether the VAR parameters in equation (8) conform to the nonlinear restriction

$$z'RA[I-RA]^{-1} = [0\ 1]. \tag{9}$$

This restriction implies that movements of the actual (tax-smoothing) budget surplus reflect those of the optimal (tax-smoothing) fiscal surplus; failure of this restriction implies that the government is not optimally smoothing its taxation path. Examination of whether the optimal and actual (smoothed) fiscal surpluses are similar, which would be a finding

supportive of the tax-smoothing hypothesis, can be done by inspection of a plot of the respective series or, more formally, by estimation of the equation

$$sur_t^{*sm} \equiv \Lambda Q_t = \lambda_1 \Delta g_t + \lambda_2 sur_t^{sm} \quad (10)$$

where Λ is a 1x2 vector of coefficients. Optimal tax smoothing implies the joint parameter restriction $\lambda_1=0$ and $\lambda_2=1$, and nonrejection of these joint restrictions implies that movements in sur_t^{*sm} fully reflect movements in sur_t^{sm}.

While nonrejection of the first three tests is evidence supportive of tax smoothing, it does not necessarily imply that governments have been smoothing taxes. Apart from the well-known problem of a lack of power of unit root tests, tax rates could also follow a random walk if, for example, such rates were determined by a random political process. Similarly, the budget surplus could also be stationary if the government cut its deficit to help satisfy its external constraint. Nonrejection of the third (Granger causality) and fourth (equation (10)) tests of the model are direct evidence in support of the hypothesis of tax smoothing, as they indicate that the government's budget surplus is informative about future changes to government spending, and that actual fiscal balances are driven by changes in the optimal fiscal surplus.

A. The Sustainability of Indian Public Liabilities

The fourth and final step in our analysis concerns the sustainability of public liabilities. A fiscal policy is sustainable if it can be maintained into the indefinite future without leading the government into insolvency (Gerson and Nellor (1997)). Accordingly, sustainability focuses on whether fiscal policy *could* be continued indefinitely, in contrast to the tax-smoothing analysis above which focuses on the optimality of fiscal policy (that is, whether it *should* be continued). Several informal measures of fiscal sustainability indicate that the prospects for Indian fiscal sustainability have improved in the years since the economic crisis of the early 1990s, with the center's gross fiscal deficit as a share of GDP falling and its outstanding stock of liabilities being reduced for the first time in over two decades (Figures 1a-1c). To confirm the informal qualitative evidence of this recent improvement in the sustainability of Indian fiscal policy, we undertake a formal, quantitative analysis to determine if the sustainability of fiscal policy can be demonstrated empirically over the last four decades.

Our treatment of the sustainability issue follows the approach of Cashin and McDermott (1998), who considered the sustainability of net foreign liabilities in the context of the intertemporal approach to the current account. The test developed is based on a multi-period application of the single-period budget constraint, and examines the time-series properties of the stock of public liabilities in order to characterize the data-generating process

and make inferences about the sustainability of fiscal policy. By iterating the standard dynamic budget constraint forward we have

$$D_t = E_t\left[\rho^T D_T - \sum_{i=0}^{T-1} \rho^i DEF_{t+i}\right] \tag{11}$$

where the fiscal deficit is $DEF_t = G_t - \tau_t Y_t$. If the tax-smoothing model is valid (that is, the 'no-Ponzi-game' requirement holds), then we also have

$$D_t^* = E_t\left[-\lim_{T\to\infty} \sum_{i=0}^{T-1} \rho^i DEF_{t+i}^*\right] \tag{12}$$

where the optimal fiscal deficit is $DEF_t^* = G_t - \tau_t^* Y_t$, τ_t^* is the optimal tax rate, and $\rho=1/(1+r)$. Equation (12) states that the present discounted value of future fiscal deficits (or surpluses) must be matched by initial assets (or liabilities). Abstracting from tax-tilting causes of any change in the stock of public liabilities, since the stock of public liabilities consistent with the (tax smoothing) model-generated path of fiscal deficits (D_t^*) is sustainable by construction, the difference between the actual stock of public liabilities (D_t) and the stock consistent with the tax-smoothing model, ($D_t - D_t^*$), must be stationary if Indian fiscal policy is to be sustainable. That is, the present setting of Indian fiscal policy can be sustained without the need for reform if the series calculated as the difference in the two stocks of public liabilities ($D_t - D_t^*$) is stationary; if not (that is, ($D_t - D_t^*$) is found to be nonstationary), then the actual stock of public liabilities is not sustainable on unchanged fiscal settings, and requires a change in fiscal policy to ensure sustainability.

VI. Data Sources and Definitions

The data are taken from official sources—definitions and descriptions of the various data manipulations are detailed in Appendix I, and several data series are presented in Figures 1a-1d. The period covered ranges from 1951-52 (marking the beginning of India's first five-year plan) to 1996-97. For the central government, expenditure and revenue are measured, respectively, by aggregate disbursements (current expenditure, capital outlays and loans and advances), net of recovery of loans and advances of the central government, (CENEXP), and the sum of revenue receipts (including external grants) plus nondebt capital receipts of the central government, (CENREV). Accordingly, the center's fiscal deficit measure includes its loans and grants to the states on the expenditure side, and its receipt of interest and loan repayments from the states on the revenue side. This is done as the center may need to raise (lower) taxes as a result of this expenditure (revenue-raising), and hence

such fiscal actions will be affected by tax-smoothing considerations.[28] Conversely, from the point of view of the states, these center-state fiscal actions can finance state net expenditure without the need for equivalent state taxes.

Similar to the case of the center, to examine tax-smoothing behavior by the states we measure their revenue-raising as the sum of revenue receipts (including grants from the central government and the states' share in central taxes) plus nondebt capital receipts (STREV), and measure their expenditure by aggregate disbursements (current expenditure and capital outlays) net of recovery of loans made by state governments, (STEXP). Our measure of both the center and the states' budget surplus is constructed by substituting the above concepts of expenditure and revenue into the right-hand side of the government's dynamic budget constraint, which is given by $(1+n)(d_t-d_{t+1}) = \tau_t-g_t+(n-r)d_t$. The debt stocks of the center and the states are measured by the total liabilities of the central (CENLIAB) and state governments (STLIAB).[29] [30] In Indian public finance, the excess of expenditure (CENEXP and STEXP) over revenue (CENREV and STREV) for each tier of government yields the gross fiscal deficit of the center and the states (CENGFD and STGFD), respectively.

A measure of the real interest rate and real growth rate is required to derive the optimal smoothed budget surplus. We experimented with two different nominal interest rates—the first divides the central government's interest payments by its liabilities and the second is a weighted arithmetic average of the interest rates at which money is accepted by

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[28]In addition, while the average marginal tax rate drives the allocative effects of taxation, data is available only on the aggregate average tax rate. As noted by Barro (1981), use of the latter to proxy for the former implies that there has not been a substantial change over time in the relationship between the two tax measures.

[29]An alternative means to construct the relevant measure of the fiscal surplus is to use the left-hand side of the dynamic budget constraint, and examine the change in the outstanding stock of public liabilities for both tiers of government. However, in the case of India the traditionally extensive conduct of quasi-fiscal operations by its public financial institutions (see Section III) results in the extraction of off-budget resources from the financial sector, yet at the same time often stimulates the growth of government liabilities. It also means that changes in the stock of public liabilities reflect more than accretions due to the running of gross fiscal deficits, even though the latter is a critical indicator of the stance of Indian fiscal policy. For further details on such quasi-fiscal activities, see Reserve Bank of India (1997) and Mackenzie and Stella (1996).

[30]As with many developing countries, in India's case there are two main reasons why the stock of public debt may not be willingly held by market agents. First, part of India's external debt was obtained on concessional terms from official bilateral and multilateral sources, and second, part of India's domestic debt is held by financial institutions (at below-market rates of return) to satisfy liquidity requirements. See Haque and Montiel (1994) for the similar case of Pakistan.

selected commercial banks in Bombay (INT). The results proved to be insensitive to our choice of nominal interest rate; the results that we report use the second of these two measures.[31] Nominal gross domestic product at market prices (NGDP) is used to normalize the variables where appropriate, and real gross domestic product (RGDP) is used to calculate the real growth rate for the economy. Finally, for both tiers of government, the tax-smoothing component of the budget surplus is derived according to equation (2).

VII. Empirical Results—Has India Been Tax Smoothing?

For the central government, the Phillips-Hansen (1990) fully modified OLS estimator yielded a value for $\hat{\gamma}^{-1}$ in equation (2) of 1.402, with an associated standard error of 0.040.[32] The value of this estimate shows that tax tilting has been very important for the Indian central government and has led deficits to be much larger than they otherwise would be. It also implies that the central government has a preference for deficits falling over time. A likely important source of this incentive to tilt deficits toward the current period has been the extensive quasi-fiscal activities of India's public financial institutions, chiefly the large-scale taxation of financial intermediation through seigniorage and financial repression (as outlined in Section III). These quasi-fiscal activities resulted in India's real rate of interest (r) being low (and often negative) for much of the sample period, yielding low values for the effective interest rate faced by government ($R^{-1} \equiv (1+r)/(1+n)$), indicating that the government has a high discount rate ($\beta < R$) and γ^{-1} is much greater than one.

The value of $\hat{\gamma}^{-1}$ for India far exceeds the value of this parameter in previous empirical work for developed countries of Australia (Olekalns 1997, $\hat{\gamma}^{-1}$=0.96), Canada (Ghosh 1995, 0.93), and the United States (Ghosh 1995, 0.94). This result reflects the fact that tax tilting, carried out through seigniorage and financial repression, is a much more important source of net revenue for India than the other (all developed) countries which have been examined in the literature for evidence of tax-smoothing fiscal behavior. The tilting component of the Indian fiscal balance is quantitatively extremely large, and the value of $\hat{\gamma}^{-1} = 1.40$ indicates that the component of the actual Indian fiscal deficit attributable to tax tilting is equivalent to forgoing 40 percent of taxation revenue in the near term, and subsequently raising taxes over time to clear the accumulate stock of liabilities. In contrast, tilting has been of relatively less importance for the state governments; the estimated value of $\hat{\gamma}^{-1}$ is 1.185 with a standard error of 0.020. Some indication of the respective magnitudes of tax tilting can be gauged from

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[31]The consumer price index (CPI) is used to convert these nominal rates to real rates, and we assume that the states borrow at the same interest rate as the central government.

[32]Phillips-Perron unit root tests (using an intercept and trend) for the center reveal that both τ_t (-1.317) and $[g_t + (r\text{-}n)d_t]$ (-2.037) are integrated of order one (the null hypothesis of a unit root cannot be rejected at the 5 percent level of significance), and so the possibility of cointegration exists. A similar result was found for the states, with τ_t (-1.905) and $[g_t + (r\text{-}n)d_t]$ (-3.026) also integrated of order one.

Figures 2 and 3, which show the actual deficits and the tax-smoothed deficits (with the tax-tilting component removed) for the central and state governments. While the smoothed budget outcome for the center returned to surplus in 1991-92 for the first time since the late-1970s (Figure 2), the smoothed budget position of the states has been in surplus in most years since the mid-1970s (Figure 3).

Table 1 reports the results of three different tests of the unit root and stationarity hypotheses. The tests are used to evaluate the predictions made by the tax-smoothing model that the average tax rate follows a random walk and that the smoothed budget surplus is stationary. The table shows the results from the augmented Dickey-Fuller (1984) (ADF) and Phillips-Perron (1988) (PP) unit root tests, and the Kwiatkowski et al. (1992) (KPSS) test for stationarity. For the central government, these results support the tax-smoothing hypothesis. The ADF and PP tests are unable to reject the unit root hypothesis for the average tax rate, and this is consistent with the KPSS test which rejects stationarity. The respective tests also show that the first difference of government expenditure is clearly stationary and so, under the tax smoothing hypothesis, the smoothed component of the budget surplus should also be stationary. This is confirmed by the respective tests. With one exception, the test results are similar for the state governments. The exception is the KPSS test applied to the smoothed budget surplus of the states, which rejects stationarity at the 5 percent level of significance. However, the stationarity hypothesis is not rejected at the 1 percent level, and so we proceed on the assumption that the smoothed budget surplus (sur_t^{sm}) is $I(0)$.[33]

Table 2 shows the results from the Granger causality tests. For the central government, the hypothesis that the budget surplus Granger causes changes in government expenditure is rejected by the data at the 5 percent level of significance. However, the hypothesis cannot be rejected at the 10 percent level, and we interpret this as providing some evidence that the central government's budget surplus is informative about future changes to central government expenditure, which is consistent with tax smoothing. In contrast, Granger causality does not characterize the results for state governments, and this is an unambiguous rejection of tax smoothing.

The actual (tax-smoothed) budget surplus derived from equation (2), and the optimal (tax-smoothed) budget surplus derived from equation (8), are graphed in Figure 4 (for the central government) and Figure 5 (for the state governments). There is quite a close correspondence between the actual and optimal smoothed surpluses for the central government. This is confirmed by Wald test results for the parameter restrictions implied by the tax-smoothing hypothesis (Table 3), which examine whether there is a close association between movements in the actual (tax-smoothed) budget surplus and the optimal (tax-smoothed) budget surplus. For the central government, the test shows that the parameter

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[33]Using the critical values from the Phillips-Ouliaris (1990) Z(t) residual-based cointegration test, we find that the null hypothesis of a unit root for sur_t^{sm} can be rejected at the 5 percent significance level in favor of stationarity, for both the center and the states. Accordingly, we accept that equation (2) is a cointegrated regression.

Table 1. Unit Root and Stationarity Tests

	τ_t	sur_t^{sm}	g_t	Δg_t
ADF Test				
Center	-1.303	-3.599*	-2.341	-7.128*
States	-2.041	-4.671*	-1.608	-8.226*
PP Test				
Center	-1.317	-3.639*	-2.379	-7.116*
States	-1.905	-4.654*	-1.690	-8.552*
KPPS Test				
Center	1.401*	0.129	1.343*	0.283
States	1.584*	0.618*	1.580*	0.144

Notes: ADF and PP refer to the augmented Dickey-Fuller (1984) and Phillips-Perron (1988) unit root tests, and KPSS refers to the Kwiatkowski et al. (1992) test for stationarity. The lag length for the ADF test is determined using the lag deletion technique recommended by Campbell and Perron (1991), where lags are successively deleted until a significant lag is reached. The maximum lag was set at four. For the PP test, the lag length was set at three periods for all variables (the results did not change appreciably for other lag lengths). Both the ADF and PP test regressions include an intercept term. The results for the KPSS tests are for two lags (the results did not change appreciably for other lag lengths). A * indicates that the null hypothesis of a unit root (for the ADF and PP tests) or the null hypothesis of stationarity (for the KPSS test) can be rejected at (at least) the 5 percent significance level. The 1 percent, 5 percent and 10 percent critical values are -3.58, -2.93 and -2.60 (for the ADF and PP tests), and 0.739, 0.463 and 0.347 (for the KPSS test), respectively.

Table 2. Granger Causality Test

$$\Delta g_t = \sum_{i=1}^{p} \alpha_i \Delta g_{t-i} + \sum_{i=1}^{p} \beta_i sur_{t-i}^{sm}$$

		lag	α_1	β_1	F
Center	$sur_t^{sm} \rightarrow \Delta g_t$	1	-0.016 (0.157)	0.289 (0.163)	3.139*
States	$sur_t^{sm} \rightarrow \Delta g_t$	1	-0.414 (0.184)	-0.231 (0.141)	2.686

Notes: The Granger causality test is an F-test to determine if the (smoothed) budget surplus causes (helps predict) changes in government expenditure, that is, whether β_1=0. The lag length, p, was chosen by minimizing the Schwarz Bayesian Criterion; the maximum lag length tried was p=4. The figure in parentheses is the (heteroscedastic-consistent) standard error. A * denotes that the null hypothesis of no causation can be rejected at the 10 percent level of significance, indicating that the current budget surplus does have predictive power for future changes in government expenditure.

Figure 2. Central Government Actual and Smoothed Budget Surpluses

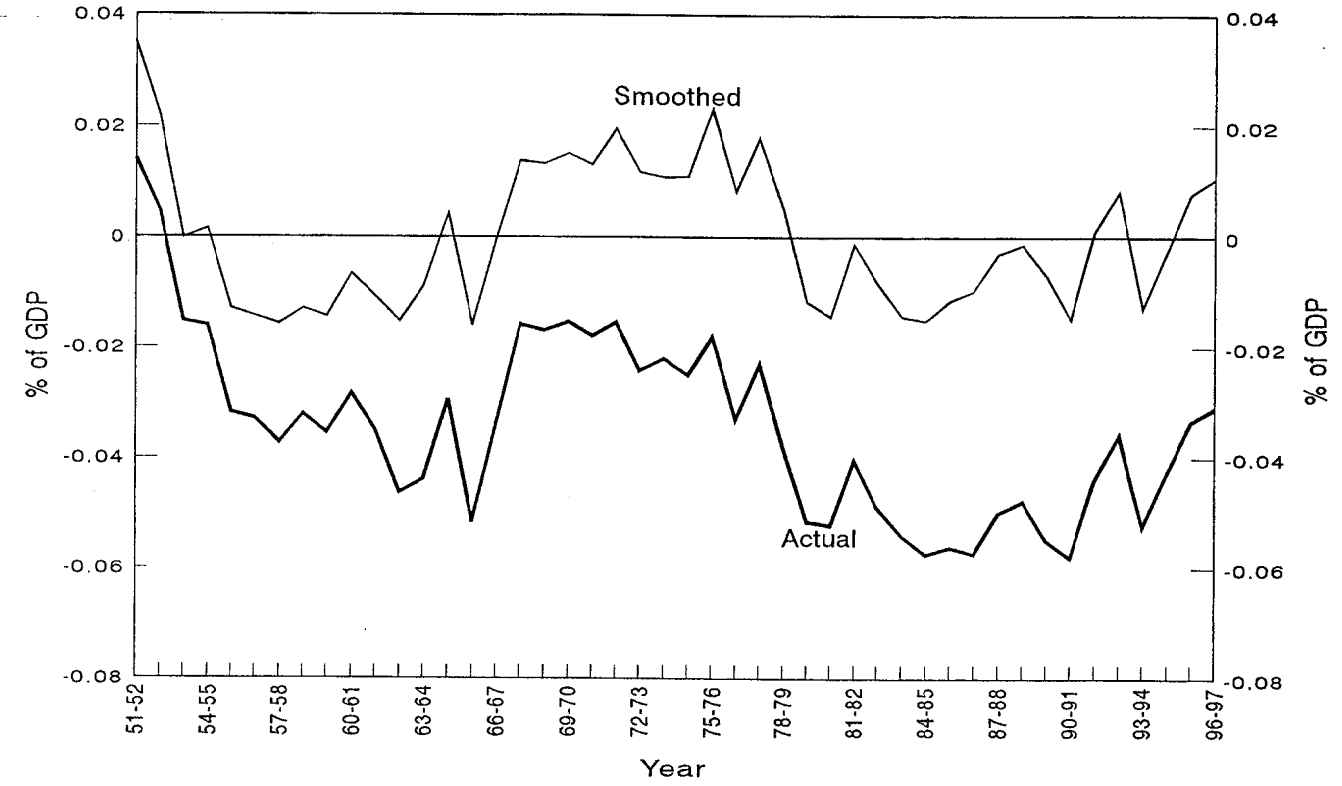
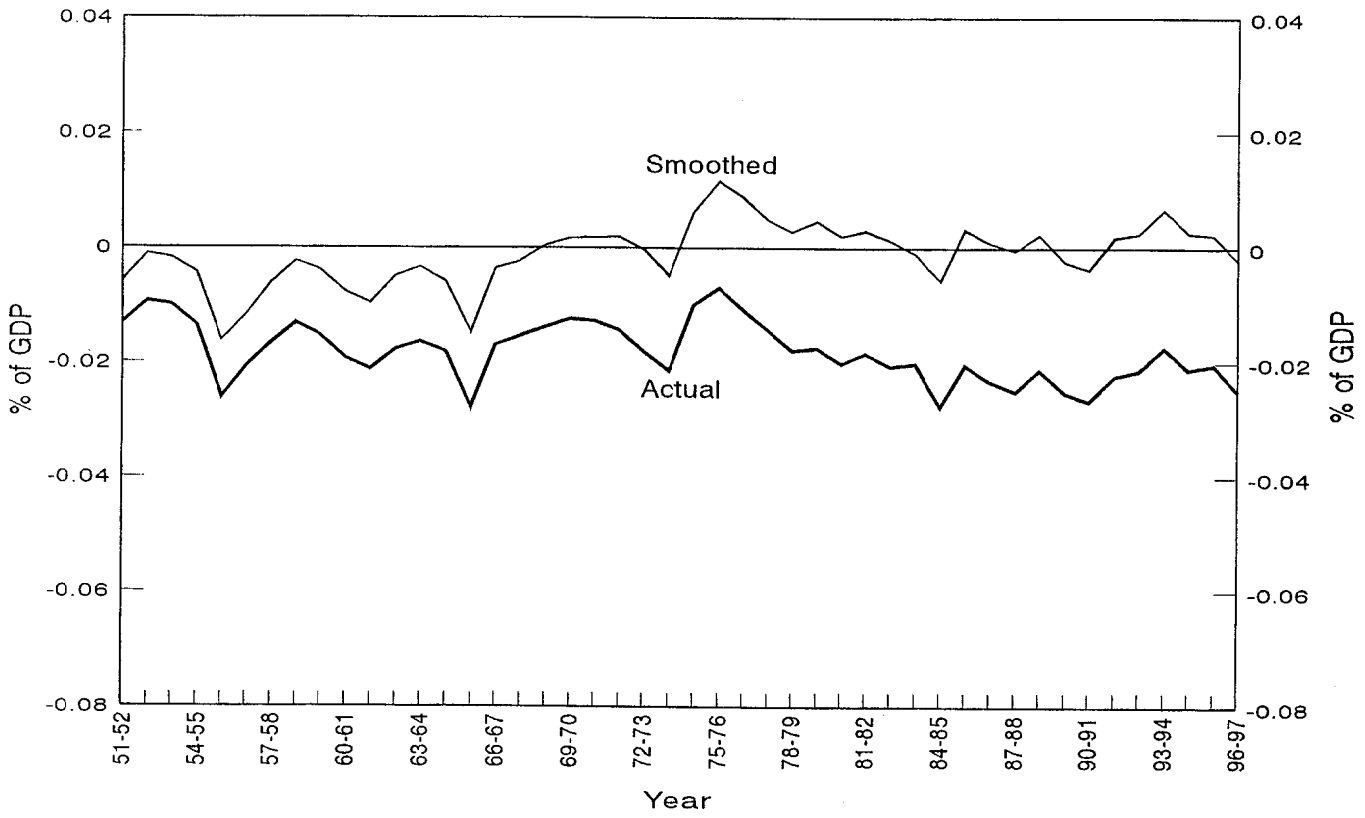


Figure 3. State Governments' Actual and Smoothed Budget Surpluses



restrictions implied by tax smoothing on the VAR are not rejected by the data, indicating that the differences between the actual (tax-smoothed) and optimal (tax-smoothed) surpluses observed in Figure 4 represent just random sampling error. In particular, the estimated coefficient on λ_1 is not significantly different from zero, and the estimated coefficient on λ_2 is not significantly different from one. Accordingly, the central government of India has engaged in tax-smoothing behavior over the period analyzed, in that it responded to expected future changes in government spending by running budget imbalances, rather than altering contemporaneous government revenue. In this connection, the traditional inability of the central government to satisfy its intertemporal budget constraint from conventional (tax and nontax) revenue sources raised the likelihood of public borrowing being its preferred response to future shocks to government spending—behavior consistent with the tax-smoothing hypothesis.[34]

Table 3. Wald Test Results: Central Government

$$sur_t^{*sm} \equiv \Delta Q_t = \lambda_1 \Delta g_t + \lambda_2 sur_t^{sm}$$

$\hat{\lambda}_1$	$\hat{\lambda}_2$
0.002	0.878
(0.125)	(0.455)

$$\chi_2^2 = 0.094$$

Notes: The coefficients $\hat{\lambda}_1$ and $\hat{\lambda}_2$ are the estimated parameters from equation (10). The Wald test statistic (distributed as a χ_2^2) is to determine whether the estimated VAR coefficients satisfy a restriction of the tax-smoothing model, in particular the null hypothesis that $\hat{\lambda}_1=0$ and $\hat{\lambda}_2=1$. This restriction is not rejected at the 1 percent level of significance (the 1 percent critical value is 9.21). The significance level at which the null hypothesis can be rejected (p-value) is 0.954. The figures in parentheses are heteroscedastic-consistent standard errors.

[34]This inability to garner sufficient revenue stems largely from the narrowness of the tax base, widespread tax evasion and exemptions, weak tax administration, the poor economic performance of revenue-earning public enterprises, and the fact that a large part of economic activity is undertaken in the underground economy (see Joshi and Little (1994, 1996)).

Figure 4. Central Government Actual and Optimal Smoothed Surpluses

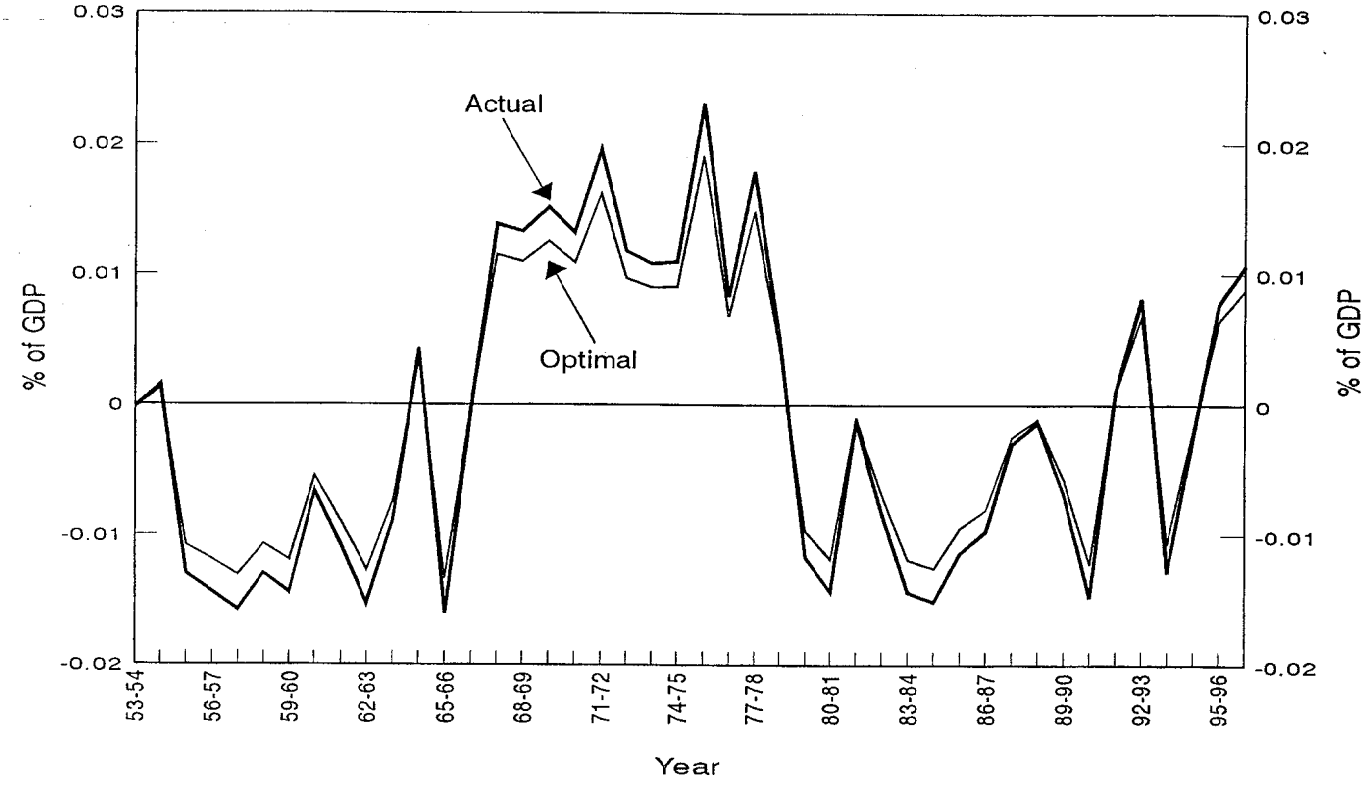
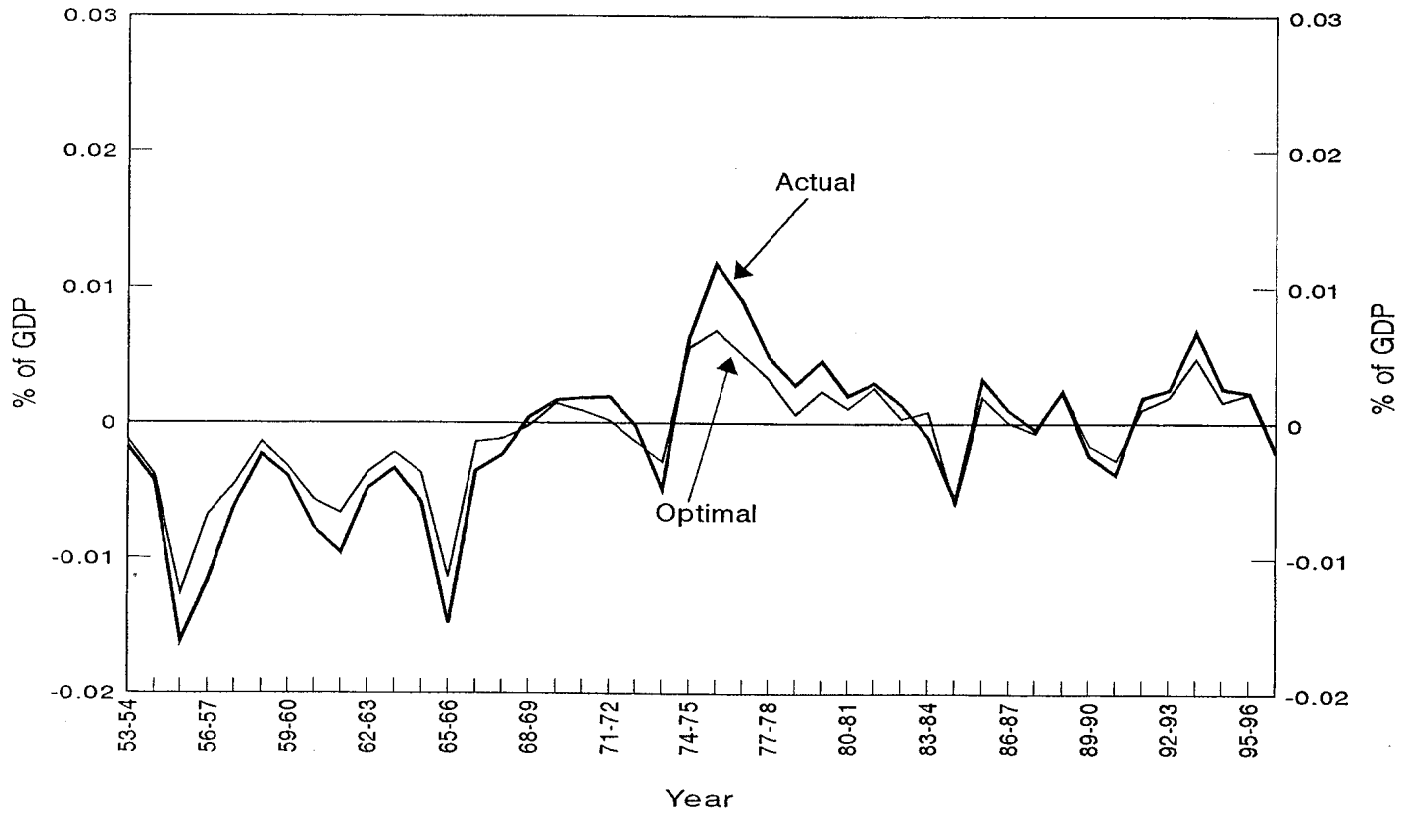


Figure 5. State Governments' Actual and Optimal Smoothed Surpluses



The correspondence between the actual and optimal smoothed surpluses for the state governments is also quite close, although given the absence of Granger causality, this probably reflects some memory in the process underlying changes to government expenditure and does not imply acceptance of the tax-smoothing hypothesis (Figure 5). Given the rejection of tax smoothing, we do not report the results from the Wald test for the state governments. We did, however, carry out the Wald test for the state governments and although we cannot reject the parameter restrictions implied by the tax-smoothing hypothesis, this is almost certainly due a lack of precision in obtaining estimates for λ_2, which had an estimated value of 0.668 but an associated standard error of 0.610. Accordingly, the Indian state governments have not been engaging in tax-smoothing behavior—a finding similar to that of other investigations of tax smoothing for subnational governments (see Section II).

A. Why Might There be No Tax Smoothing?

Recent empirical evidence from developed countries finds support for the tax-smoothing hypothesis for Canada and the United States, yet the hypothesis is not accepted for Australia. While this paper finds evidence in favor of tax smoothing for the central government of India, it does not for the Indian state governments. More generally, what factors may inhibit recourse to tax smoothing by national and subnational governments? First, if there is no change expected to the level of government spending over the planning horizon, then there would optimally be a balanced budget in each period. Second, the government may be engaging in counter-cyclical fiscal policy, so that taxes as a share of GDP would be negatively-correlated with GDP growth. There seems little evidence of this in the Indian context, as real GDP growth and real GDP per capita growth were relatively low in the 1970s and relatively high in the 1960s and 1980s, while the states' actual budget deficit was quite close to the optimal deficit in the high-growth 1980s, yet the actual deficit was smaller (larger) than the optimal in the low-growth 1970s (high-growth 1960s).[35] Third, a large share of public expenditure may be for the provision of public goods, which could enter agents' utility functions. In contrast, Barro's (1979) representative agent is assumed to only have one source of utility, that being the minimization of distortions caused by a system of second-best taxation. This reason may be of particular relevance to the states of India, which carry out the bulk of national spending on social services—if such expenditures are valued by economic agents, then the utility loss from distortionary taxes could be balanced by the utility gain from the provision of such public goods.

Fourth and most importantly in the Indian context, the accumulation of fiscal deficits may be partly driven by political factors, which bias fiscal policy toward deficit spending (Alesina and Perrotti (1995)). The positive theory of government finance, as set out in Barro (1979), considers an infinitely-lived government choosing a series of tax rates with the

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[35]In addition, India, like many developing countries, has viewed public expenditure (and especially public investment) as an engine of growth and development. Given that revenue has traditionally been difficult to raise, there has consequently been an ongoing incentive to run fiscal deficits (Joshi and Little (1994)).

goal of minimizing any accompanying excess burden. However, the finite lives of governments can require that the political process be included as an important determinant of the tax rate. Roubini (1991), Edwards and Tabellini (1990) and Alesina and Tabellini (1989) found that more unstable political systems (defined in terms of the probability of a government change as perceived by the current government) tend to be associated with larger government borrowing, in that there is an incentive for policy makers to borrow in excess of the optimum, and let successor governments bear the burden of repaying the debt in the future. The frequent changes of government during the 1980s in India would be consistent with observed overborrowing by government, and the political economy theory of budget deficits.[36] [37]

Finally, the ability of optimizing subnational governments to smooth tax rates may be constrained by the mobility of taxable factors of production, whereby mobile factors seek out jurisdictions where the current benefits of public expenditure exceed the current costs (as noted in Section II). However, the cross-state mobility of taxable factors in India is low (given the linguistic, cultural and transportation constraints to the mobility of labor), weakening the applicability of this argument in explaining the rejection of tax smoothing by the Indian states (Cashin and Sahay (1995)).

B. Deviations from Intertemporal Smoothing

Figure 4 reveals that while the budgetary behavior of the center is generally consistent with the tax-smoothing model, there are some distinct time periods when the center's taxes strayed from the optimal path. During the decade of the 1970s the central government was "deficit constrained," in that there was insufficient recourse to deficit financing as the actual surplus exceeded the optimal surplus, implying that actual tax rates exceeded optimal tax rates. Conversely, during the late-1950s and 1980s the actual budget deficit was larger than the optimal budget deficit, implying that insufficient taxes had been levied and there was excessive deficit financing. This result is consistent with the work of Buiter and Patel (1993), who noted the rapid growth in India's debt to GDP ratio in the 1980s, and the role the fiscal deficits of the 1980s played in generating foreign borrowing to finance the excessive current account deficits of that decade. In the 1990s, the center's fiscal policy has been close to its optimal setting. Moreover, the path for optimal budget outcomes reveals that in the late-1960s and 1990s it became optimal for India's central government to switch from running fiscal

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[36]Bhat and Varalakshmi (1994) find evidence for the impact of political changes on the expenditure patterns of state governments, yet only for the post-1977 period, when non-Congress Party governments came to power in many Indian states.

[37]In recent related work, Talvi and Végh (1997) adapt Barro's (1979) tax-smoothing model by incorporating a political distortion. This distortion makes it costly to run budget surpluses in good times (as required under tax smoothing), due to the consequent pressures induced to raise public expenditure. Their model predicts that optimal fiscal policy will be procyclical, varying positively with fluctuations in the tax base, and accords with evidence from several Latin American countries.

deficits to running fiscal surpluses (indicative of future expenditure rises), while in the mid-1950s and early-1980s it became optimal to switch from running fiscal surpluses to running fiscal deficits (indicative of future expenditure cuts).

The pattern of optimal and actual (smoothed) fiscal outcomes for the states, as revealed by Figure 5, is quite different to that for the center, with the optimal fiscal policy typically being one of relatively small deviations (apart from the mid-1960s and mid-1970s) around a balanced budget. Broadly, in the mid-1970s it became optimal for India's state governments to switch from running fiscal deficits to running fiscal surpluses (indicative of future expenditure rises). Prior to the mid-1970s the actual budget deficit was typically larger than the optimal budget deficit, implying that insufficient taxes had been levied and there was excessive deficit financing. Conversely, after the mid-1970s the actual budget surplus was typically larger than the optimal budget surplus, implying that actual tax rates exceeded optimal tax rates.

VIII. Empirical Results—Has There Been Excessive Public Borrowing in India?

The final test that we consider relates to the sustainability of India's stock of public liabilities. The rationale is to see whether the stock of liabilities consistent with the optimal path of fiscal deficits generated by the tax-smoothing model, (D_t^*), evolves in tandem with the actual stock of public liabilities, (D_t), as set out in equations (12) and (11), respectively.[38] This test is conducted by examining whether (D_t-D_t^*), the implied excess accumulation of public liabilities, is stationary. To formally test for the presence of nonstationarity we use the augmented Dickey-Fuller (ADF) unit root test, and construct D_t^* assuming that the 1953-54 actual stock of liabilities equals the stock of liabilities consistent with the optimal path of fiscal deficits generated by the tax-smoothing model. The result for the liabilities of the central government (CENLIAB) indicates that the ADF test statistic has a value of -2.305, which fails to reject the null hypothesis of nonstationarity in the difference between the actual and tax-smoothing based stocks of liabilities at the 5 percent level of significance. Accordingly, the difference between the actual and tax-smoothing based stocks of liabilities contains a unit root, implying that the two series deviate, and have no tendency to follow one another. That is, under unchanged fiscal policies, India's stock of public liabilities is not sustainable.

This result can also be seen in Figure 6, which shows the actual (D_t) and tax-smoothing based (D_t^*) stocks of liabilities, and the implied excess accumulation of public liabilities (D_t-D_t^*). Over the period 1953-54 to 1996-97 (D_t-D_t^*) has been trending upward,

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[38]The tax-smoothing model generates conditions under which the stock of public liabilities can be repaid, as fiscal deficits derived under the model are sustainable, by definition. Accordingly, if the actual stock of public liabilities is rising more rapidly than the stock of liabilities implied by the tax-smoothing model, then the current path of fiscal deficits under unchanged policies is unsustainable.

indicating that public borrowing is in excess of what expected future fiscal surpluses can service. This shows there has been excess accumulation of public liabilities over the period, vis-à-vis the base year of 1953-54. While the excess accumulation was relatively small until the early 1970s (the stock of actual liabilities was less than 5 percent of GDP greater than its optimum level), the difference between the two stocks of liabilities grew rapidly during the 1970s and 1980s, peaking in the late-1980s at about 25 percent of GDP. During the 1990s $(D_t-D_t^*)$ has declined as a result of the central government's program of fiscal consolidation (apart from a reversal in 1993-94), so that in 1996-97 the actual stock of public liabilities was about 18 percent of GDP higher than the level consistent with the optimal path of fiscal deficits generated by the tax-smoothing model.

Clearly, the actual stock of public liabilities reflects both tax smoothing and tax tilting considerations. Given that the Indian central government was found to tax smooth (see Tables 1-3 and Figure 4), then the bulk of its excessive public borrowing can be attributed to tax tilting, with the government levying low taxes in the present and (implicitly) higher taxes in the future so that intertemporal solvency can be satisfied. In the Indian context, this requires that at some future point in time taxes will need to be raised and fiscal surpluses (or smaller fiscal deficits) will need to be run to service the government's stock of liabilities. Given the tax-tilting induced accumulation of public liabilities which occurred in the 1970s and 1980s, and the external crisis this excess borrowing induced, this result underscores the need for continuation of the process of fiscal consolidation which began in the early 1990s.

The result for the liabilities of the state governments (STLIAB) indicates that the ADF test statistic has a value of -4.846 (significant at the 1 percent level), which rejects the null hypothesis of nonstationarity in the difference between the actual D_t and tax-smoothing based (D_t^*) stocks of liabilities at the 5 percent level of significance. Accordingly, the implied excess accumulation of public liabilities $(D_t-D_t^*)$ is stationary, implying that the two series of liabilities do not deviate, and have a tendency to follow one another. In addition, the states' $(D_t-D_t^*)$ series has fluctuated in a very narrow band about zero over the 1953-54 to 1996-97 period, and during the 1990s the actual and tax-smoothing based stocks of liabilities have been very similar (Figure 7). The borrowing constraints imposed by both the Constitution and the central government appear to have acted to ensure that excessive borrowing by the states did not arise. Interestingly, the volatility of the $(D_t-D_t^*)$ series has fallen dramatically since the 1990s, implying that, given the states' limited access to the fiscal tools which would enable them to engage in tax tilting, and their tendency to broadly follow tax-smoothing behavior (even though formal tests of tax smoothing are rejected), their pattern of borrowings from the central government and the market is not excessive.

Figure 6. Central Government Actual and Implied Optimal Debt Stocks

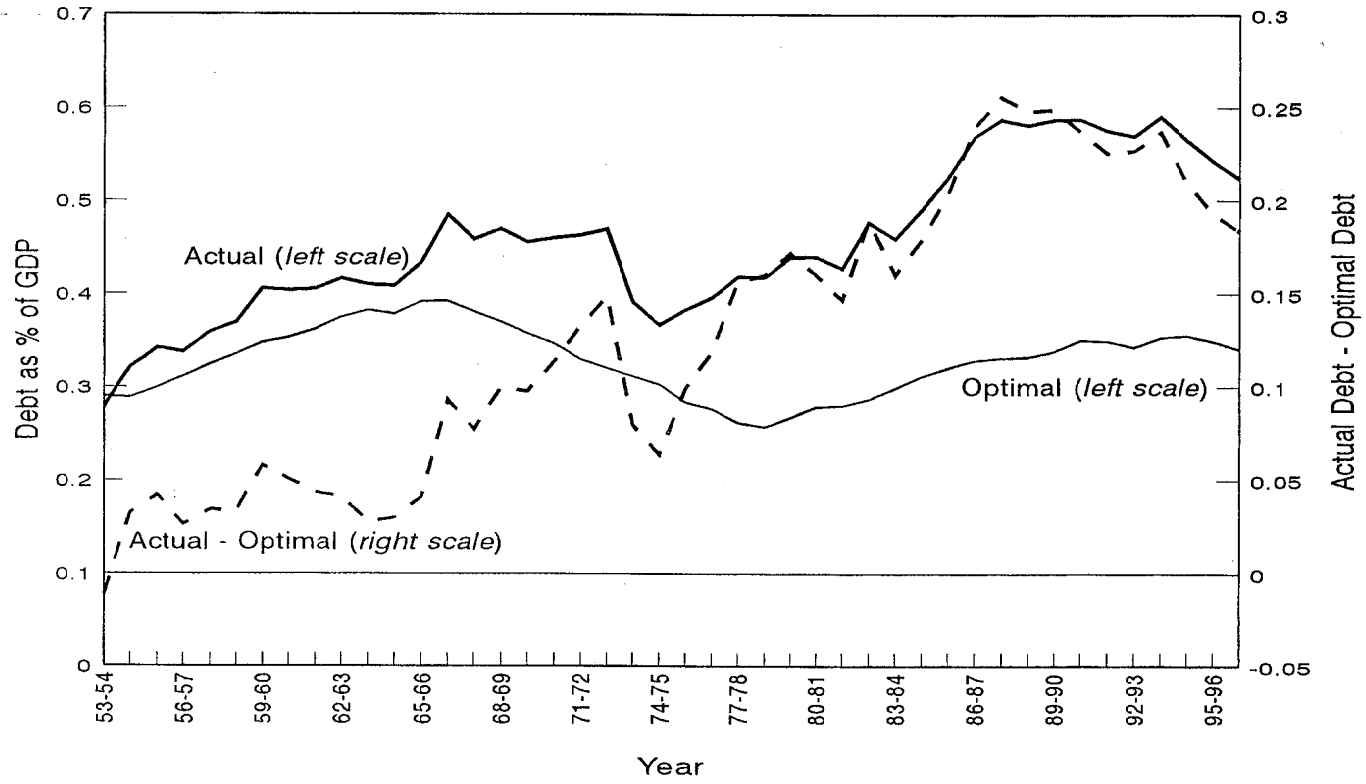
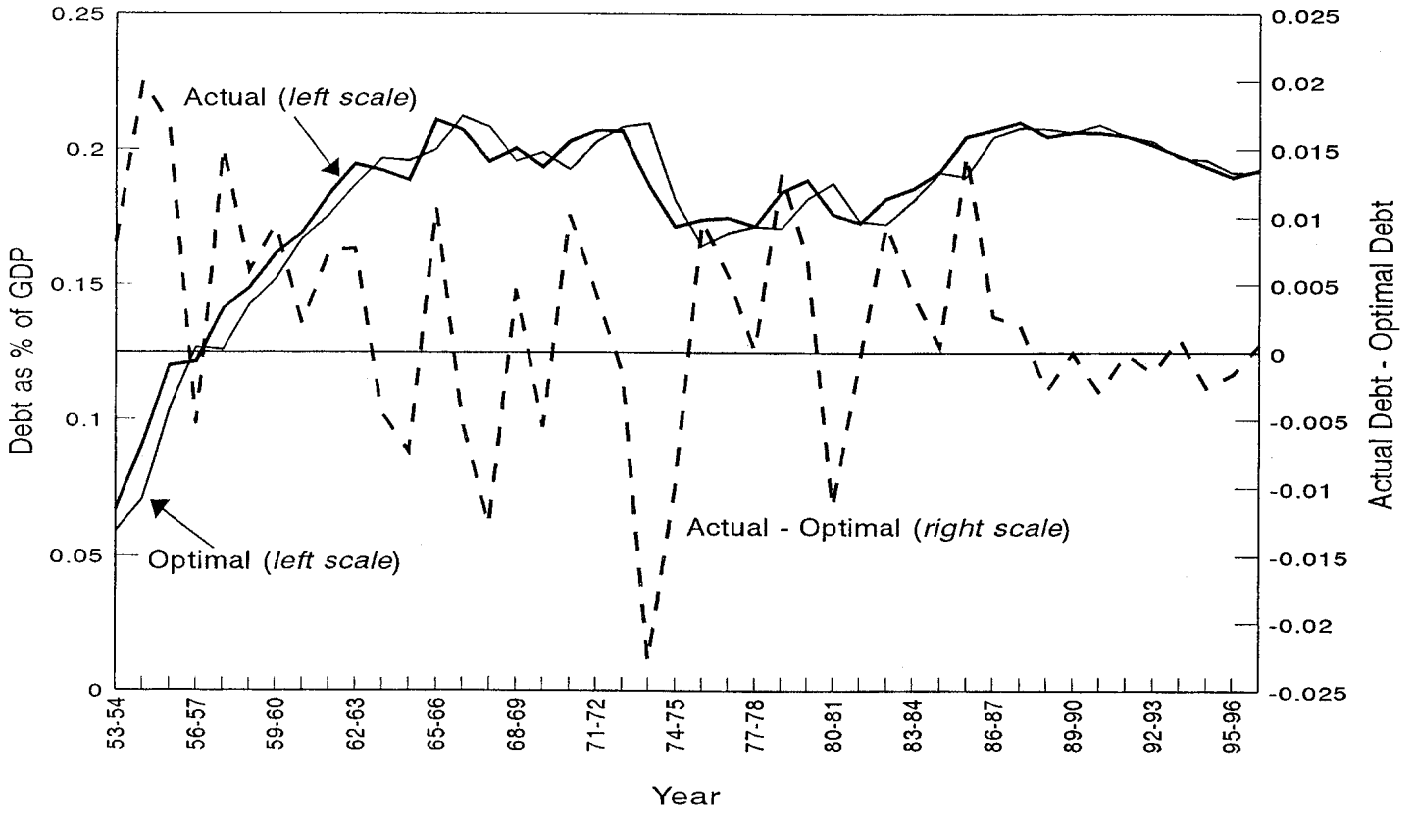


Figure 7. State Governments' Actual and Implied Optimal Debt Stocks



IX. Conclusion

In this paper we examined the evidence for tax-smoothing behavior in India for both the central and state governments, over the period 1951-52 to 1996-97. In response to a temporary increase in government spending, the tax-smoothing approach predicts that the tax burden of funding this expenditure will be spread over time (and so the government will run a fiscal deficit); conversely, a permanent increase in spending should be financed by raising contemporaneous taxes (resulting in no fiscal deficit). The intertemporal tax-smoothing model is successful in explaining the behavior of the fiscal deficits of the Indian central government, and so the center does keep its tax rate relatively constant (smooth) in the presence of temporary shocks to expenditure. We argue that the traditional inability of the central government to satisfy its intertemporal budget constraint from conventional (tax and nontax) revenue sources raises the likelihood of public borrowing being its preferred response to shocks to government spending—behavior consistent with the tax-smoothing hypothesis. Moreover, this same inability to garner sufficient receipts from conventional revenue sources results in tax tilting behavior by the central government, with quasi-fiscal activities such as seigniorage and financial repression being important sources of net revenue, through the implicit taxation of financial intermediation. In contrast to the center, the volatility of state taxes has been excessive relative to those which would be consistent with minimizing the excess burden arising from the levying of distortionary taxes, and so the states do not tax smooth.

As to the sustainability of central government borrowing, the recent downward movements in informal measures of fiscal sustainability (ratio of deficit to GDP and ratio of outstanding liabilities to GDP) have been encouraging. However, quantitative analysis based on long-term trends indicates that during the period 1953-54 to 1996-97, under unchanged policies, India's stock of liabilities was not on a sustainable path. In particular, the tax-tilting-induced overborrowing of the 1970s and 1980s has yielded a stock of liabilities which deviates significantly from the stock of liabilities generated from the series of optimal (tax-smoothing) fiscal deficits. As of 1996-97, the actual stock of public liabilities was about 18 percent of GDP higher than it would have been under tax smoothing (down from a peak of over 25 percent of GDP in the late 1980s), implying that fiscal surpluses (or at least smaller fiscal deficits) will need to be run in the future to ensure intertemporal solvency. This result emphasizes the importance of maintaining and enhancing the process of fiscal consolidation which began in the early 1990s.

DATA

All data used have been derived from official sources, and are annual in frequency. It should be noted that they are for financial years ending March 31; for example, 1994-95 refers to the year ending March 31, 1995.

1. INT is the call money rate for scheduled commercial banks in Bombay for the period 1951-52 to 1956-57, then the money market rate (rate offered in the Bombay interbank market) from 1957-58 onwards, both taken from IMF, International Finance Statistics (IFS), line 60b.

2. NGDP is nominal GDP at market prices, in billions of rupees (Rs. crore), taken from IMF, IFS line 99b and Central Statistical Organization (1996).

3. RGDP is real GDP at market prices, in billions of 1990-91 rupees (Rs. crore), taken from IMF, IFS line 99bp and Central Statistical Organization (1996).

4. GDPDEF is the GDP deflator (base 1990-91=100), derived from NGDP and RDGP.

5. CPI is the consumer price index for industrial workers for 50 centers of India, taken from IMF, IFS line 64 and Central Statistical Organization (1996).

6. CENREV is the sum of revenue receipts (including external grants) plus nondebt capital receipts of the central government (Government of India, GOI), in billions of rupees (Rs. crore), taken from Budgetary Position of GOI, Revenue Receipts of GOI and Capital Receipts of GOI tables of *Report on Currency and Finance*, and IMF staff estimates.

7. CENEXP is aggregate disbursements (revenue expenditure, capital outlays and loans and advances), net of recovery of loans and advances of the central government, in billions of rupees (Rs. crore), taken from Budgetary Position of GOI, Revenue Expenditure of GOI and Capital Disbursements of GOI tables of *Report on Currency and Finance*, and IMF staff estimates.

8. CENGFD is the gross fiscal deficit of the central government, and is calculated as the excess of CENEXP over CENREV. It is financed by external borrowing and domestic borrowing, where the latter comprises market borrowing (chiefly from publicly-owned financial institutions), treasury bills, changes in cash balances with the RBI, small savings scheme, and state provident funds.

9. CENINT is interest payments made by the central government, in billions of rupees (Rs. crore), taken from Revenue Expenditure (nondevelopment expenditure) table of *Report on Currency and Finance*. This measure is for total interest payments, involving interest payments on: internal debt, external debt, small savings and provident funds, reserve funds, and other obligations.

10. CENLIAB is total liabilities of the central government as at March 31, in billions of rupees (Rs. crore), taken from Liabilities and Capital Investments and Loans Advanced by Central Government table of *Report on Currency and Finance* and Ministry of Finance, *Budget Papers*, various issues. Total liabilities includes: public debt, small savings scheme, provident funds, and reserve funds and deposits.

11. STREV is the sum of revenue receipts (including grants from the central government) plus nondebt capital receipts of state governments, in billions of rupees (Rs. crore), taken from Consolidated Budgetary Position of States, Revenue Receipts of States and Capital Budget of States tables of *Report on Currency and Finance*, and IMF staff estimates. The figures for state governments relate to Part A and B states only for the period 1951-52 to 1955-56.

12. STEXP is aggregate disbursements (revenue expenditure and capital outlays) net of recovery of loans made by state governments, in billions of rupees (Rs. crore), taken from Consolidated Budgetary Position of States, Revenue Expenditure of States and Capital Budget tables of *Report of Currency and Finance*, and IMF staff estimates. The figures for state governments relate to Part A and B states only for the period 1951-52 to 1955-56.

13. STGFD is the gross fiscal deficit of the states, and is calculated as the excess of STEXP over STREV. It is financed by domestic borrowing, chiefly market borrowing (from publicly-owned financial institutions) and loans and advances from the central government. The figures for state governments relate to Part A and B states only for the period 1951-52 to 1955-56.

14. STLIAB is total liabilities of state governments as at March 31, in billions of rupees (Rs. crore), taken from Outstanding Liabilities of State Governments table of *Report on Currency and Finance*. Total liabilities involves: internal debt, loans and advances from the central government, and provident funds. The figures for state governments relate to Part A and B states only for the period 1951-52 to 1955-56.

15. STINT is interest payments on total liabilities of states (and so includes payments on loans from central government and internal debt), in billions of rupees (Rs. crore), and is taken from Revenue Expenditure of States table of *Report on Currency and Finance*. Prior to 1967-68, interest payments and debt servicing are lumped together, so the former has been estimated for the period 1951-52 to 1966-67 using the average ratio of interest payments to total debt servicing for the period 1967-68 to 1969-70 of 0.7. The figures for state governments relate to Part A and B states only for the period 1951-52 to 1955-56.

16. STSHARE is the share of central government revenue given to the states, derived from central government taxes on income, estate duty and union excise duties, in billions of rupees (Rs. crore), and is taken from Revenue and Expenditure of GOI (Revenue Account) table of *Report on Currency and Finance*, and IMF staff estimates.

17. GRANTS is grants from the central government to the states, in billions of rupees (Rs. crore), and is taken from Revenue Receipts of State Governments table of *Report on Currency and Finance*, and IMF staff estimates.

18. LOANS is loans from the central government to the states, in billions of rupees (Rs. crore), and is taken from the Capital Budget of State Governments table of *Report on Currency and Finance*, and IMF staff estimates.

19. REPAY is repayments of loans to the central government by state governments, in billions of rupees (Rs. crore), and is taken from the Capital Budget of State Governments table of *Report on Currency and Finance*, and IMF staff estimates.

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