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THE IMPACT OF TAX POLICY ON CORPORATE DEBT IN A DEVELOPING ECONOMY: A STUDY OF UNQUOTED INDIAN COMPANIES *

by

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ABSTRACT

Taxation has potentially important implications for corporate behaviour. However, there have been few studies of the impact of taxation on companies in developing countries, and fewer still concerned with unquoted companies. In this paper, we study the impact of tax policy on the financial decisions of a sample of unquoted companies in India during the period 1989-99 when tax rates were generally reduced as part of a wider programme of financial liberalization. We examine the impact of the tax regime on company financing decisions, within the context of a model of company leverage, controlling for non-tax influences suggested by the theory of corporate finance. The analysis is carried out using a balanced panel consisting of the published accounts of 97 Indian unquoted companies which reported continuously during 1989-99. The model is estimated using GMM. Estimates of the impact of the 1990s tax reforms are derived, and implications for policy are drawn.

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1. *Introduction*

Judging from the dearth of studies in the literature, tax policy would not seem to have a significant role to play in corporate financial decisions in developing countries. The emphasis in the literature has been on the reduction of tax rates, compliance issues and on fiscal stability, with the detailed incentive structure of the tax system regarded of second-order importance, at least in the early stages of financial reform (for example, Perotti, Strauch and von Hagen, 1998). In theory however, tax policy can have an important impact on corporate financial decisions. The literature originates with Modigliani and Miller (1963) who pointed out that if corporations can deduct debt interest before arriving at taxable profits, a wedge is driven between the after-tax costs of equity and of debt, and this creates an exception to their famous irrelevancy theorem (Modigliani and Miller, 1958). Subsequent key contributions to the corporate tax literature include King (1974), Miller (1977), Mayer (1986), and Keen and Schianterelli (1991).

There have been numerous empirical studies of the impact of tax on corporate financing decisions in the major industrial countries (eg. Mackie-Mason, 1990; Shum, 1996; and Graham; 1996a, 1996b, 1999). Graham (2004) reviewed this literature and concluded that, in general, taxes do affect corporate financial decisions, but the magnitude of the effect is "not large". Exceptionally, Gordon and Lee (2001) found that (US) corporate tax changes had substantial effects on leverage, especially for the largest and smallest companies. Other studies have investigated taxation as just one element in a general model of corporate financial decisions. Harris and Raviv (1991) and Prasad, Green, and Murinde (2005) have reviewed this literature. However, the vast majority of this research is concerned with quoted companies in the industrial countries. There are few, if any, studies of tax policy and company financing in developing countries and, to our knowledge, none at all concerned with ***un***quoted companies.

Quoted and unquoted companies face different financing constraints as between debt and equity and among different kinds of debt (Röell, 1996). Evidence from India (Green, Murinde, and Suppakitjarak, 2003) and elsewhere (eg. Italy: Pagano, Panetta and Zingales, 1998) suggests that unquoted companies finance their activities in different ways from quoted companies and respond differently to changes in external constraints. Unquoted companies face less stringent disclosure and governance requirements[1] but have fewer financing possibilities than quoted companies. The first point would suggest that unquoted companies could be more nimble in rearranging their accounts following a tax change, implying that their financing decisions would be more responsive to tax changes than quoted companies. However, their more limited range of financing options would imply that unquoted companies may have less scope to respond to tax changes than quoted companies. A more general issue for developing countries is that unquoted companies are typically medium-sized enterprises which could, in principle, form the next generation of large employers. The World Bank (1989) has identified a problem of the "missing middle" in developing countries: the seeming inability of small enterprises to grow into larger companies. Financing constraints have been identified as a possible cause of this problem (Buckley, 1997). It is therefore important to identify if economic policy can help promote or inhibit enterprise financing and, ultimately therefore, enterprise development.

In this paper, we study the impact of tax policy on the financial decisions of a sample of unquoted companies in India over the period 1989-99[2]. India is of interest for several reasons. It has maintained a thriving private sector from the earliest phases of industrialization, and has a wide range of unquoted companies to utilise for this research. Post World-War II, India pursued economic and financial policies that emphasized state planning but, beginning in the mid-1980s, the capital markets were liberalised. The pace of liberalization quickened in the 1990s with a series of policy reforms including a progressive lowering of personal and corporate tax rates and simplifications to the tax system, so that by 2000, tax rates were substantially below those in effect a decade earlier[3]. The sheer size and diversity of the Indian company sector are more than sufficient reasons for investigating Indian company financing. In addition, the succession of tax changes in the 1990s offers a unique opportunity to evaluate the impact of changes in tax rates on unquoted company financing decisions in a developing economy.

To study the effects of tax policy changes we utilize a balanced panel of 97 unquoted companies covering the period 1989-99. We set up a general model of firms' financial decisions which includes variables which control for non-debt tax shields and the effects of tax changes. We specialize the analysis by concentrating on firms' leverage ratios but we investigate the robustness of the model by considering different measures of leverage. An important innovation is that the model is estimated using Arellano and Bover's (1995) GMM technique to control for the endogeneity of some of the explanatory variables. We find that GMM provides considerable efficiency gains as compared with more traditional panel-data estimators. Our model shows the impact of tax policy on company leverage, and we then simulate the model to estimate the overall effects of the 1990s tax changes on aggregate unquoted company debt in India.

The paper is organized as follows. In section 2 we summarize the theory of leverage and set out the model to be tested. We discuss the treatment of taxation and tax policy in the context of this model. In section 3 we discuss the company accounts data used in the analysis and set out the empirical counterparts of the variables in the model, apart from those related to the tax system. In section 4 we set out some basic facts about the Indian tax system and its development in the 1990s. We explain how we measure the impact of tax policy in India and set out the relevant variables for this purpose. Section 5 discusses the estimation and testing procedures. The results are contained in section 6. Section 7 contains some concluding remarks. Some additional detail is contained in an appendix.

2. Taxation in a model of leverage

The modern theory of corporate capital structure has four main strands. First are theories based on asymmetric information, such as the Pecking Order approach (Myers and Majluf, 1984); second are agency cost theories (Jensen and Meckling, 1976); third are transactions costs theories (Williamson, 1988); and fourth are tax-based theories (Modigliani and Miller, 1963). However, the tax system necessarily interacts with other determinants of financing decisions, and this leads to more integrated approaches such as the Tax-cum-Bankruptcy model (Kraus and Litzenberger, 1973). Unfortunately these theories have mostly delivered a host of special cases which, while adding to our understanding of firm financial decisions, often do not lend themselves to direct testing with a closed-form regression model. Thus, a common if not entirely satisfactory method of testing corporate capital structure theory is to specify a regression model of the form:

$$y_{nt} = \sum_h \beta_h X_{h,nt} + \sum_g \gamma_g V_{g,n} + \sum_f \delta_f U_{f,t} + \varepsilon_{nt} \qquad \ldots 1$$

Here, y_{nt} is a measure of leverage for company n at time t. The explanatory variables include company- and time-specific variables: $X_{h,nt}$ ($h = 1,\ldots,H$); time-invariant variables (eg. the industrial classification of the company): $V_{g,n}$ ($g = 1,\ldots,G$); and company-invariant variables (eg. official rates of tax): $U_{f,t}$ ($f = 1,\ldots,F$). ε_{nt} is an error term whose properties we discuss in section 5. This is a panel data model with $n = 1,\ldots,N$ indexing companies, and $t = 1,\ldots,T$ indexing time. The explanatory variables are not typically derived directly from any optimisation programme, but are variables that, according to theory, may be correlated with firm leverage. Indeed the form of (1) that we use is more general than many existing studies, which have employed cross-section data rather than panel data, and have often ignored the implications of time- or company-invariant variables (Rajan and Zingales, 1995).

Table 1 about here

In table 1 we set out the variables used in this study and the signs of their coefficients which we expect in a leverage regression. An illustrative empirical reference is also given. Different theories of capital structure can be used to justify different combinations of these variables and, sometimes, different signs. The sign we show is that found in a majority of empirical studies or suggested by several theories. We give a second sign and a second reference if the literature does not exhibit a clear consensus as to the sign. (See Prasad, Green and Murinde, 2005, for further details.) The variables are divided into 3 groups: non-tax variables suggested by capital structure theory, variables specific to India which we discuss in section 3, and tax variables.

The 8 variables derived from capital structure theory are well-known (Harris and Raviv, 1991). However, it is worth observing that many studies of capital structure include relatively few explanatory variables. Recent research has concentrated on the dynamic adjustment process (Ozkan, 2001; Guha-Khasnobis and Bhaduri, 2002; Nivorozhkin, 2003; Banerjee, Heshmati and Wihlborg, 2004). We do not include dynamics for three reasons. First there is little agreement on a general theory of capital structure, and certainly no accepted theory of the dynamic adjustment process; a dynamic model could be rejected or incorrectly accepted because of a combination of mis-specified static and dynamic models. Second, the standard GMM estimator for dynamic models (Arellano and Bond, 1991) involves a loss of information in that time-invariant effects cannot be identified. This is a serious problem in corporate finance studies, for company-specific effects are known to be important in financing decisions. Third, we do not intend to test a 'new' theory of finance but to identify the importance of tax relative to other determinants of leverage. Accordingly a simpler approach appears more appropriate.

Tax policy concerns tax rates and non-debt tax shields. The impact of different tax rates was set out by King (1974, 1977), who considered bilateral choices among debt, equity or retentions, and showed that, under certain assumptions, these depend on the following conditions:

If retained earnings are given, and: $(1 - i) > (1 - t)(1 - m)$, debt is preferred to equity;

If equity is given, and: $(1 - i) > (1 - t)(1 - z)$, debt is preferred to retained earnings;

If debt is given, and: $(1 - m) > (1 - z)$, equity is preferred to retained earnings.

Here, z = capital gains tax rate, t = corporate profits tax rate, m = marginal tax rate on dividends, and i = marginal tax rate on debt interest[4]. These conditions distinguish between equity and retentions by assuming that the payoffs to equity are dividends and those to retentions are capital gains. In practise, the true rate of tax on equity is some combination of the two, a point also emphasised by Miller (1977). Non-debt tax shields include tax-deductible cash or non-cash expenses (such as depreciation), or profits from specific activities which are given favoured tax treatment. Miller (1977) recognised that the value of a firm's non-debt tax shields would affect its ability to use debt as a tax shelter because it may run out of pre-tax profits to shelter. This argument was later formalized by DeAngelo and Masulis (1980), and Mayer (1986) extended the analysis to allow for loss carry-over. However, Keen and Schiantarelli (1991) showed that their arguments applied only to bilateral margins (eg. debt-equity or debt-retentions). Simultaneous equilibrium of debt, equity and retentions typically requires additional conditions to be imposed on the problem, such as constraints on investors' ability to engage in tax arbitrage.

Empirical researchers have differed in the manner in which they have sought to model the impact of tax policy. Chowdhury and Miles (1989) used statutory tax rates to calculate King's conditions, and used these as regressors in a model of British firms' debt and dividend policies. An obvious problem with this procedure is that few statutory rate structures can be summed up in a single marginal tax rate. Moreover, statutory tax rates are true marginal rates only under restrictive assumptions, particularly because of the existence of non-debt tax shields. A firm which can newly utilize a deduction or which loses a deduction may face a marginal tax rate anywhere between zero and 100%, and there can be substantial inter-firm variation in true marginal tax rates (Graham, 1996a). Finally, in a short panel, there is often little or no time-variation in tax rates, and obviously none at all in a cross-section.

Therefore, a more common practise is to use estimated non-debt tax shields directly as an explanatory variable in a regression model (Titman and Wessels, 1988). The problem with this approach is that while some non-debt tax shields, such as depreciation, can be estimated from company accounts, others such as loss carry-overs can only be estimated indirectly, if at all. This has led some researchers to use as regressor a firm's effective tax rate, estimated as the ratio of taxes paid to pre-tax earnings (eg. Booth, Aivazian, Demirguc-Kunt and Maksimovic, 2001[5]). However, this represents the average rather than the marginal rate of tax, and is the outcome of a whole sequence of corporate business decisions. Moreover, since each one is determined partly by the firm, neither non-debt tax shields nor the effective tax rate is a measure of tax policy. Graham (1996a) estimated 'true' marginal tax rates for US firms allowing in particular for the carry-forward and carry-back of losses. However, his procedure required seven years' pre-sample data to calculate each year's marginal tax rates. Indian data do not have an adequate time span for this purpose, and they do not include information about loss carry-back or carry-forward which is available in the US. It is therefore not feasible to estimate firm-specific marginal tax rates for India. Moreover, any calculated firm-specific marginal tax rates will be an unreliable guide to the effects of policy because they are necessarily *ex-post*, as they are functions of realized profits. Company decisions may have been based on marginal tax rates assuming a different level of profits from that which subsequently materialized. Thus, it is not clear that calculated marginal tax rates are more useful than official rates as a measure of the marginal tax rates that firms believed they faced when making financial decisions. Furthermore, work by Graham (1996b) and Plesko (2002) suggests that, leaving aside loss carry-overs, the top statutory tax rate is the best proxy for the true marginal rate for most (US) firms[6].

The upshot of these considerations is that we are unlikely ever to find a unique mapping from the whole tax code to the tax actually paid by each individual firm. Therefore, we would argue that statutory tax rates (measured by King's conditions) and variables which measure the effects of the tax code (effective tax rates and non-debt tax shields) are all relevant in understanding the effects of tax policy. Furthermore, statutory tax rates provide an unambiguous measure of tax policy. We explain the empirical counterparts of these variables in section 4.

3. Data and Variables of the Model

3.1 Data

Our sample is based on all private non-financial unquoted Indian companies within the *Prowess* database (*Centre for Monitoring the Indian Economy*, 1997) that reported balance sheets and income statements every year during 1989-99. This excludes foreign companies, financial companies, and companies which were majority owned by the central or state governments. We also excluded: firms whose accounts contained arithmetic errors; firms whose sales or net assets were non-positive in any account year; firms which reported negative depreciation or net worth[7]; firms with any account year of under 7 months; and firms which reported more than one set of accounts in the same calendar year[8]. These filters left a balanced panel of 97 companies. The model was estimated over 1990-99, with 1989 data being absorbed by the instrumental variables used in estimation. These data provide a relatively long time-span for such a large sample of unquoted companies in a developing economy.

Data in *Prowess* are organized in a standardized format following Indian accounting standards. Indian companies are not required to produce consolidated accounts and, unlike their OECD counterparts, most choose not to consolidate (Price Waterhouse, 1996; Institute of Chartered Accountants of India, 2000). This implies that there may be some double-counting of intra-group assets and liabilities. The vast majority of companies have a year-end report date in March, at the end of the tax year. However, as some companies have other report dates, all the macroeconomic data used in the analysis, such as tax rates and prices, were aligned with the report date of each company on a quarterly basis[9].

Business groups are of long-standing existence in India. These are groups of companies within which effective control is exercised by the same group of shareholders, and they generally follow the same conglomerate structure as business houses in other Asian countries. More than 60% of the companies in our sample are part of a business group[10]. Hirota (1999) found that Japanese keiretsu have an important impact on debt policy, with keiretsu firms having 4-5% higher leverage *ceteris paribus* than non-keiretsu firms. We follow Hirota by using shift dummies to control for group effects in India.

Table 2 about here

Table 2 summarises the broad properties of the sample. In 1994, the median company had sales of about $12m and net assets of about $7m, emphasizing that these are mostly not large firms.

3.2 Empirical variables in the model

Capital structure theory does not provide an unambiguous empirical concept of leverage. In addition, an important issue, which has been neglected in the empirical literature, is that some qualitative predictions of the theories of leverage depend in part on the exact measure of leverage to be used. Accordingly, we employed several different measures of company leverage (table 3)[11]. These embody three different concepts of debt, the widest of which is ***total liabilities***. This includes conventional accounting items which are not usually thought to reflect borrowings to finance a company's assets[12]. A narrower measure is ***debt + trade credit***. This includes all debt due to institutions and the market, and trade credit received. Trade credit received is sometimes netted out against credit given, or excluded altogether from debt, as it can be argued that it finances a company's ongoing business rather than its assets *per se*. Excluding trade credit gives our narrowest measure which we simply call ***debt***. For the denominator of the leverage measure, it is sensible to relate total liabilities to total assets; for completeness we also related the narrower measures of debt to total assets. However, it is more usual to relate the narrower definitions of debt to company capital. We therefore utilized two other denominators for the leverage ratio: ***debt*** + ***equity*** + ***retentions*** and ***debt*** + ***equity***. Equity and retentions consist of shareholders' funds and specific reserves. Equity consists of a firm's equity capital and share premium reserves, and corresponds as nearly as possible to the cumulative total of funds raised through share issues. We used these 7 measures of leverage in separate regressions and compared the results obtained from each, partly as a test of theory, but also as a check on the robustness of the empirical model.

Tables 3 and 4 about here

The explanatory variables of the model are listed in table 4. ***Asset tangibility*** measures a company's capacity to secure its debt, and hence the ability of creditors to secure their assets in the event of bankruptcy. It should be positively related to leverage. However, a company's non-fixed assets include liquid assets which provide a cushion against financial distress. A low fixed assets ratio may reflect high liquidity which is usually positively related to leverage, implying a negative relation between tangibility and leverage. Accordingly, Titman and Wessels (1988) argue that it is the proportion of a company's assets which are not realisable that is of more interest. ***Asset intangibility*** measures a company's inability to secure its debt and hence should be negatively related to leverage. ***Size*** is used in the model as a measure either of diversification or information. Large, diversified companies may be less risky or have lower bankruptcy costs and thus have higher leverage. An alternative view is that large companies are less transparent, less-easily monitored, and so will have lower leverage. Gordon and Lee (2001) find evidence that the size of company has a significant effect on its response to tax changes. Size may be measured either as (log) real net sales or real net assets. We prefer to use sales as they are less prone to contamination by idiosyncratic asset structures or reporting procedures.

Growth opportunities are measured by the product of the retention rate and the return on equity, following Klein and Belt (1992)[13]. Firms with more rapid growth prospects may pass up profitable investment opportunities if they are highly leveraged and will therefore prefer lower leverage ratios. Trade-off theories of leverage would suggest a positive relationship between ***profitability*** and leverage, as more profitable companies can gain easier access to the debt market. Recent empirical evidence is more favourable to pecking order theories which predict a negative relationship: more profitable companies signal their profitability by relying on internal financing rather than debt (Myers and Majluf, 1984). However, since the pecking order consists of retentions first, followed by debt, and then equity, even if profitability is negatively related to debt/(debt+equity+retentions), it is more likely to be positively related to debt/(debt+equity). As our data distinguishes between these measures of leverage, we can examine this issue precisely.

Risk-return considerations suggest that ***business risk*** will be negatively related to leverage, and this is the consensus of the evidence. In theory however, risky firms have a higher option value than do safer firms: their probability of financial distress is higher, but so is their probability of escape from distress. Thus, risk could be positively related to leverage. Risk is commonly measured by the standard deviation of returns over some past time period, but this method throws away potentially valuable time series data. We proceeded instead by estimating firm-by-firm regressions of real value-added on time[14]. The absolute residuals from these regressions are consistent estimates of the conditional standard deviations of value-added (Engle, 1982), and these were scaled by mean value-added to arrive at our measure of business risk (*RISK*). A time trend is a crude one-dimensional model of profit, and we enlarged it in a simple way by distinguishing between firms with a positive trend and those with a negative trend. We would expect firms with a declining trend in profits to encounter financial distress at some point. For such firms, the positive option value of a volatile business may be more important than the conventional negative valuation of the risk. One would therefore expect the size and possibly the sign of the coefficient of *RISK* in a leverage regression to depend on whether the risk was measured about a rising or declining trend. Thus we distinguish between: *RISKP* = *RISK* for companies with an upward trend in value added, and *RISKN* = *RISK* for companies with a declining trend in value added. In fact, *RISKN* was never significant, and it was therefore dropped from the analysis.

The ***age of the firm*** is a reputational variable: the older the firm, the higher its expected leverage ratio, because the better its reputation. ***Industry class*** is associated with the specialization of the capital stock, which affects the liquidation value of the company: the more specialized the capital, the less its liquidation value and the lower the firm's leverage ratio (Titman, 1984). We control for the industrial class of a firm using an 11-industry classification. Differences in behaviour between firms which are members of a ***business group*** and those which are not are modelled using three shift dummies corresponding to the classification in *Prowess*: top 50 business houses, other large business houses, and 'small' business houses. A correlation matrix of all the company- and time-specific variables in the model is provided in the appendix.

4. Modelling the Impact of the Tax System in India[15]

India operates a broadly classical system of corporate tax[16]. Corporate profits are taxed in the hands of the company on a mildly progressive scale, and dividends are taxed again in the hands of shareholders. Companies act as tax collectors: they deduct personal income tax at source at a statutory rate before payment of dividends and this tax cannot be set against the corporate profits tax. Through May 31st 1997, dividends were included in shareholders' ordinary income. Their total incomes were subject to a single rate scale, with the dividend tax deducted at source being put towards their general income tax obligations. Effective June 1997, the rate of dividend tax was set at a flat 10% which is deducted at source by the paying company. Shareholders have no further obligation to tax, but cannot reclaim excess tax if their total tax obligations are less than dividend tax already paid. Neither dividends nor the 10% withholding tax on dividends can be set against the corporate profits tax. However, dividends paid by a company can be deducted from the dividends it receives, the latter being otherwise taxed as part of company profits. Interest income is included in households' ordinary income and taxed accordingly. Individual income tax is progressive with the degree of progressivity having been reduced considerably during the 1990s (Shome, 1997). Available evidence suggests that the majority of private shareholders have incomes in excess of the minimum at which the top rate of tax becomes payable (Gupta, 1991)[17]. Company profits tax is also (very mildly) progressive[18].

Realised capital gains were taxed as part of income until April 1992. Since then, the rules have distinguished between short-term gains which are taxed as income, and long-term gains which are taxed at a uniform rate of 20%[19]. Gains are calculated after indexing the purchase price of the asset by an appropriate price index.

We calculated ***King's tax conditions*** (table 5) using the highest applicable statutory tax rates faced by debt and equity-holders. This involves two important simplifications. First, the tax cost of equity is allocated to dividends and that for retentions to capital gains. Second, some stakeholders may be subject to tax at lower rates. However, since realized profits and tax rates may differ from those which are anticipated when financial decisions are made, we would argue that the highest statutory rates represent the best rule of thumb for the purposes of the present analysis. Also, this procedure is broadly consistent with the results of Graham (1996b) and Plesko (2002). Moreover, as we explain below, we control directly for the effects of non-debt tax shields and variations in the effective tax rate using other variables in the model.

Table 5 about here

Evidently there have been significant changes in the incentive structure for debt, equity, and retentions implied by the tax system. The introduction of the flat 10% dividend tax in 1997 had a particularly marked impact on the debt-equity margin, although its stated purpose was to encourage retentions and therefore to act mainly on the equity-retentions and debt-retentions margins (Dutt and Sundharam, 2000). We cannot be precise about the predicted signs of King's tax conditions in the regressions, partly because different leverage measures capture the proportions of debt, equity and retentions somewhat differently, and partly because of the simplifications already noted. If dividend tax is associated with equities and capital gains tax with retentions, we would expect *TXDVR* and *TXDVE* to be positively signed but, in general, they could be of either sign, as could *TXEVR*. Finally, it should be noted that, although there is no cross-sectional variation in King's tax conditions at a point in time, there is cross-sectional variation in our sample because of variations in the duration and end-dates of company accounting years. (See section 3.1) This helps to identify the impact of these tax conditions.

Following, *inter alia*, Booth *et al* (2001) we used the ***effective tax rate*** to measure the impact on firms of the tax system as a whole. If this is a forward-looking rate used in financial decisions, we would expect a positive relationship with leverage. However, a high effective tax rate could reflect high profitability, or past low leverage for reasons unrelated to tax. Thus the relationship to leverage could be negative, as indeed Booth *et al* (2001) found. To allow for the possible endogeneity of this variable, we instrument it in the estimation procedure.

India's corporate tax system provides four main ***non-debt tax shields***: operating losses can be carried forward up to 8 years, but not carried back; depreciation is allowed, and can be carried forward indefinitely; all profits arising from exports, where the foreign exchange is remitted back to India, are deductible; and certain research and development (R&D) capital spending is deductible. The estimation of loss carry-forward requires presample data which is not available. Furthermore, given the difficulty of arriving at separate estimates of the remaining non-debt tax shields[20], we followed Titman and Wessels (1998) and used earnings, interest and taxes to estimate total non-debt tax shields.

5. Estimation Procedures

As explained in section 4, there is some cross-section variation in the King tax ratios. For estimation purposes therefore, equation (1) can be specialised to:

$$y_{n,t} = \sum_h \beta_h X_{h,n,t} + \sum_g \gamma_g V_{g,n} + \varepsilon_{n,t} \qquad \ldots 2$$

The crucial issues in estimating (2) are: the composition of the error term, the structure of the error variances, and the possible endogeneity of the explanatory variables. The general panel data model allows for a two-way error component model implying that ε_{nt} has the form:

$$\varepsilon_{n,t} = \mu_n + \eta_t + \lambda_{nt} \qquad \ldots 3$$

Here, $\mu_n \sim \text{IID}(0, \sigma_\mu^2)$, $\eta_t \sim \text{IID}(0, \sigma_\eta^2)$, and $\lambda_{nt} \sim \text{IID}(0, \sigma_\lambda^2)$ are IID random variables with μ_n being the unobservable firm effect, η_t the time effect, and λ_{nt} the remaining disturbance.

Diagnostics aimed at clarifying the structure of the error components and other estimation issues suggest that there are significant firm effects and heteroskedasticity in the data (table 6), but there is no evidence of time effects, and two pooling tests are comfortably accepted. Hausman tests suggest that there may be correlation between individual effects and explanatory variables in some cases but not others. We conclude that we need to allow for company effects and heteroskedasticity, but not time effects. This is consistent with results reported by Green Murinde and Suppakitjarak (2003) who find that there were only gradual changes in the balance sheets of unquoted companies in this period. These are likely to be explained by movements in the explanatory variables of the model rather than by more independent structural changes.

Table 6 about here

We turn next to endogeneity. Estimation of panel data models with a lagged adjustment term is usually done using the Arellano and Bond (1991) procedure. However, we would argue that endogeneity is not confined to models in which there is lagged adjustment. Since some of the X_h in (2) are scaled by total assets, they are necessarily endogenous in models seeking to explain the ratio of debt or liabilities to total assets (*GDAi*). In general, one would expect many of the entries in a firm's balance sheet at a point in time to be determined simultaneously, and since balance sheet entries appear on both the left-hand side and the right-hand side of (2), at least some of the X_h are necessarily endogenous in any version of (2). In addition, the effective tax rate is evidently not independent of any measure of leverage. Under these circumstances, the results of the Hausman tests are not surprising. However, endogeneity in this sense is commonly ignored in empirical studies of capital structure. Rajan and Zingales (1995 arbitrarily lag all their explanatory variables one period; other recent studies ignore the issue entirely and treat all the X_h as exogenous (Wiwatanakantang, 1999; Booth *et al*, 2001). In this paper we argue that properly allowing for the endogeneity of the X_h has an important impact on the size and more particularly the significance of the estimated coefficients.

To clarify these issues, it is convenient to rewrite (2) in matrix notation as:

$$y = W\theta + \varepsilon \qquad \ldots 4$$

Here, $y' = (y_{11},\ldots,y_{N1},\ldots\ \ldots,y_{1T},\ldots,y_{NT})$; and W is a $NT\times(G+H)$ matrix of explanatory variables. W is partitioned as $W = (X,\ i_T\otimes V)$: X are firm- and time-varying explanatory variables; V are time-invariant variables; and i_T is a T-vector of ones. We define $X = (X_1,\ X_2)$; and $V = (V_1,\ V_2)$, such that $(X_1,\ V_1)$ are "exogenous" and $(X_2,\ V_2)$ are "endogenous". X_{2t} are correlated with λ_t; but X_{1t} are not. Lagged values of X_2 are assumed to be uncorrelated with λ_t but, since V_2 are time-invariant, they are necessarily correlated with λ. Thus: $E(\lambda|X_1,\ X_{2,t-j},\ V_1,\ \mu) = 0$; $(j > 0)$. As there are no dynamics, the simplest estimation procedure which allows for endogeneity and individual effects is the within-group (one-way) instrumental variable (OWIV) estimator:

$$\hat{\theta} = (Z'Q'QW)^{-1}Z'Q'QY \qquad \ldots 5$$

$Q = (I_{NT} - i_T i_T'/T\otimes I_N)$ is the within-group operator, so that: $Q\varepsilon = [\varepsilon_{n,t} - \bar{\varepsilon}_n]$, with $\bar{\varepsilon}_n = \Sigma\varepsilon_{n,t}/T$, and $Q'Q = Q$. Z is a matrix of instruments which in our model can include $X_{2,t-j}$. However, the OWIV estimator does not allow for the heteroskedasticity which we observe in our data. Moreover, there is a loss of information, as the time-invariant effects (γ in (2)) are unidentified.

It is now recognised that a multivariate estimation method is the most effective method of dealing with endogeneity and heteroskedasticity (Chamberlain, 1982; Arellano and Bond, 1991). However, an important disadvantage of the Arellano-Bond method is that it too leaves the time-invariant effects (γ) unidentified. In this paper we follow instead Arellano and Bover (1995) whose method enables us to identify all the parameters of interest, including γ. To implement this method, we interpret (4) as T cross-section regressions, each corresponding to a certain year, and pre-multiply this system by the non-singular transformation:

$$H = \begin{bmatrix} K \\ i_T'/T \end{bmatrix} \qquad \ldots 6$$

K is any $(T - 1)\times T$ matrix of rank $(T - 1)$ such that $Ki_T = 0$. Arellano and Bover show that $\hat{\theta}$ is invariant to choice of K, and suggest either the first difference operator or the first $T - 1$ rows of the within-group operator. We use the within-group operator, since it splits the model naturally into $T - 1$ within-group equations and the T'th (between) equation. We then seek a matrix of instruments (Z) such that:

$$E(Z'H\varepsilon) = 0 \quad \ldots 7$$

These orthogonality conditions imply that the H-transformed version of (4) can be estimated by GMM and $\hat{\theta}$ is given by:

$$\hat{\theta} = [W'H'Z(Z'H\Omega H'Z)^{-1}Z'HW]^{-1}W'H'Z(Z'H\Omega H'Z)^{-1}Z'HY \quad \ldots 8$$

where Ω may be estimated from the residuals of a preliminary consistent estimator.

Instrumental variable estimators face a trade-off between bias and efficiency: more instruments increase efficiency but also increase bias. Ziliak (1997) has shown that this trade-off exists for GMM estimators even in large panels[21], and severe bias may occur if too many instruments are used. However, there is little guidance on how to choose a set of instruments in practise. As the within-group operator eliminates μ from the first $T - 1$ equations in our model, all exogenous and predetermined variables ($X_1, X_{2,t-j}, j>0, V_1$) are valid instruments in these equations. The within-group transformations: QX_1 and $QX_{2,t-j}$ are valid alternatives to $X_1, X_{2,t-j}$. The Tth equation is more problematic as it has to be instrumented by variables which are uncorrelated with ε, and therefore uncorrelated with the firm effect (μ) as well as with the idiosyncratic effect (λ). Defining z_T as the instrument vector in the Tth equation, Arellano and Bover (1995) show that identification of γ requires that $E(\mu|X_1, V_1) = 0$, and dim (z_T) $\geq$ dim (γ), otherwise there are insufficient instruments for the Tth equation. However, it is not easy to find time-invariant variables (V_1) which are uncorrelated with the individual firm effect. In our model we would expect industry and business group membership to be correlated with the individual effect. We can get around this problem by making the weaker assumption that the correlation between X_1 and μ is constant over time, implying that removing the time mean from X_1 (by applying the within-group transformation) will create a set of valid instruments for the Tth equation, since in this case: $E(\mu \mid X_1 - \overline{X}_1, \eta) = 0$; $\overline{X}_1 = \sum X_{1t} / T$.

Therefore, we used current values of the exogenous variables and 1 lag of the predetermined variables as instruments in the first T-1 equations ($X_{1,t-j+1}, X_{2,t-j}, j=1$), and current and 2 lags of the exogenous variables in the Tth equation ($QX_{1,t-j+1}, j=1,\ldots,3$). This was the minimum number of feasible instruments needed to obtain well-determined estimates of the parameters associated with the King conditions and to identify the parameters associated with the cross-sectional variables. Our assumptions are more conservative than is common in the literature: we instrument all variables constructed as ratios to total assets, the effective tax rate, and all the time-invariant variables in the model. The instruments are set out in full in the appendix.

6. Empirical Results

6.1 Parameter estimates

We report parameters estimated by GMM for all 7 leverage measures and, for purposes of comparison, by OWIV for *GDA1*[22] (tables 7(i) and 7(ii)). Clearly the GMM estimates are much better determined than the OWIV estimates. Nearly all the key parameters estimated by GMM are well-determined and numerically plausible, and the gain from using GMM appears to be considerable. The Sargan tests confirm that the overidentifying restrictions are accepted. We also tested equality restrictions for the coefficients associated with the King conditions, and business group and industry dummies but, given how well the coefficients are determined, it is not surprising that these are all rejected. Comparing the results across different leverage definitions, there are variations in the magnitudes of parameters as we would expect, but in general, the signs are remarkably consistent from one definition to another, with few anomalies.

We turn next to a discussion of individual parameters. The coefficients on *TANG* and *INTAN* display some anomalies with about half having the "wrong" sign. *SIZE* is uniformly positive, suggesting that size is associated with diversification, lower risk and therefore higher leverage. Profitability and risk are all signed negative, consistent with the preponderance of previous empirical evidence. However, there is no evidence of a sign change for the coefficient on *PROF* as between the *GDE* and *GDER* equations. There is therefore no support for this aspect of pecking order theory in the data. The positive coefficient on growth is less usual but is consistent with findings from small UK companies (Jordan, Lowe and Taylor, 1998). *AGE* is mostly positively signed as expected. The time-invariant variables are generally somewhat less significant. Companies in business groups generally have higher leverage than non-group companies (substantially so for some definitions), a finding that is consistent with Hirota’s (1999) results for Japan. Furthermore, the effect is larger the larger is the size cohort of the business group. The industry dummies vary in size and significance suggesting that industry effects are important for some industries but less so for others. Overall, we would argue that these results provide a convincing and robust model of leverage to use as a control to investigate the effects of taxation.

Tables 7(i) and 7(ii) about here

We therefore turn finally to the tax variables. The coefficients on non-debt tax shields are all negative as expected. Those on *TAXR* are mostly positive, a reasonable finding (but contrary to the results of Booth *et al*, 2001) that may be attributable to our use of instruments to allow for the endogeneity of this variable. The King conditions are generally consistently signed across leverage measures[23]. The debt-equity margin has the expected positive effect, but the generally negative sign on the debt-retentions margin is more surprising at first sight. The mostly positive equity-retentions margin suggests that debt and equity may be complements from the tax perspective. The signs on these conditions depend on the underlying financial policy of the company and the extent to which any tax can be precisely associated with a specific source of financing. The sign on the debt-retentions margin may be associated with the non-marketability of unquoted company shares. If ownership is stable and includes a significant managerial component, then dividends are likely to be low, and the opportunity cost of retentions may be more closely related to loss of managerial perquisites than to capital gains tax liabilities. If so, the sign on the debt-retentions margin is consistent with the generally low dividend payout rates by unquoted Indian companies (Green, Murinde and Suppakitjarak, 2003). Overall therefore, the coefficients on the King conditions are quite plausible.

In summary, the estimates of the model are well-determined in almost every particular, especially considering that this is a very heterogeneous group of companies, among which the accounting standards used in practise are likely to be quite variable in detail and in quality. This gives confidence in using the model to simulate the effects of tax changes.

6.2 Simulating the effects of tax reforms

The final step in the analysis is to evaluate the impact of the 1990s tax reforms. We do this by calculating the impact of changes in the King conditions on the aggregate debt of our sample companies. We concentrate on the King conditions because the statutory tax rates underlying them can be regarded as nearly true policy variables. Of course, the impact of the King conditions depends on the general model of leverage and on the other tax variables in the model. However, we ignore any indirect effects which arise through the impact of changes in the King conditions on other variables in the model. A detailed model of such effects would require another paper. Moreover, the use of GMM to instrument the endogenous components of the tax variables means that we can be reasonably confident that the coefficient estimates do consistently isolate the effects of the King conditions *per se*. It would be interesting to look at the effects of all the non-policy tax variables, but this too we defer to another paper.

We begin by considering any particular tax change, say in year τ. We construct adjusted series for all three King conditions which follow their historical paths through time (τ - 1), remain unchanged at time τ, and then replicate all subsequent changes in tax rates and hence in King conditions. These three series undo the effect of the tax change which occurred at time τ. Five sets of adjusted series are constructed to correspond to all the tax changes in the 1990s (table 5). Next, we use the estimated model to calculate hypothetical leverage values for all individual firms in the panel for all years using the adjusted data. For any particular tax change and leverage definition, these give a hypothetical leverage rate for each firm year-by-year in the absence of that tax change. For each firm, there are 10 observations for each of the 5 tax changes and for each of the 7 leverage measures. We then calculate each firm's outstanding debt by multiplication by the denominator of the leverage rate. For example, the *n*'th firm's leverage at time *t*, using *GDA1*, is: $GDA1_{t,n} = TL_{t,n}/TA_{t,n}$ (total liabilities/total assets). Simulated values of $GDA1_{t,n}$ without the tax change in year τ are given by: $GDA1_{t,n}(\tau)$ (t = τ+1,...,1999). Debt outstanding is: $TL_{t,n}(\tau) = GDA1_{t,n}(\tau) \times TA_{t,n}$. Finally, we sum the actual and hypothetical debt levels across firms on a year-by-year and a tax-change-by-tax-change basis. The difference between actual aggregate debt outstanding and its hypothetical level without each tax change gives the estimated impact of the tax change on a year-by-year basis. For each year, we then sum across tax changes to get the total effect on debt outstanding of all tax changes from 1991.

The preponderant effect of the 1990's tax reforms was to reduce substantially the amount of outstanding unquoted company debt, especially from 1995 (table 8). As tax rates were reduced considerably over the 1990s, this result is not surprising, but it provides further reassurance of the plausibility of the model and the estimates. The only budget covered by this study at which tax rates were raised was that of 1991, and the effect of this was a moderate increase in outstanding debt. Different leverage measures give remarkably similar results for the impact of the 1990s' tax reforms, but the quantitative effects vary considerably, suggesting that further research on different leverage measures is required.

Tables 8 and 9 about here

Budget-by-budget measures of tax impact are shown in table 9. Each row gives the effect on total debt outstanding which can be attributed year-by-year to any particular budget. The relationship between total debt and tax rates is non-linear because the dependent variable in the model is leverage rather than debt outstanding. Evidently, there were substantial variations in the impact of individual budgets. The 1994 budget included reductions in the rates of corporate profits tax and capital gains tax that reduced the tax advantage of debt. These measures reduced corporate debt in our sample by between Rs3.28bn and Rs9.92bn, by 1999, although the first-year effect was much smaller. Also of interest is the 1997 budget which introduced the flat 10% tax on dividends designed to encourage firms to retain earnings. As we noted above, this involved a substantially larger change in the debt-equity margin than the debt-retentions margin. Consequently, debt decreased following the budget, implying an increase in the combined share of equity and retentions, but it is not possible to assert whether equity financing or retentions increased as a consequence. However, these examples underline the point that the tax coefficients have to be looked at jointly rather than separately because of the simplification that each King condition gives a binary choice, treating other sources of finance as given.

The impact effects of the tax changes are broadly consistent with Graham's (2004) conclusion that tax has significant but small effects on company financing, although in many instances, the impact effect did account for a substantial proportion of the change in debt in that year. In contrast, the total effects (over several years) are much larger. The most conservative estimate implies that the overall *ceteris paribus* impact of the tax reforms was to reduce outstanding debt by 17% for our sample unquoted companies as a whole; other leverage measures give higher estimates. These figures are appreciably higher than those reported by Green and Murinde (2003) for Indian quoted companies during the same period, but are not out of line with the estimates for smaller (mostly unquoted) US companies reported by Gordon and Lee (2001). This in turn suggests that unquoted companies may respond more to tax changes than quoted companies. Which is more relevant: the impact effect or the total effect? This depends in part on our view of corporate financing decisions. On a trade-off view, any given change in desired leverage will cast a long shadow on company debt, because debt outstanding will change as the size of the company changes. A trade-off interpretation would therefore suggest that the total effect is of more interest. The pecking-order approach on the other hand would suggest that each year's financing depends primarily on the current values of the firm's objectives and constraints, and this would suggest that the impact effect is of more interest. These two interpretations give rise to important quantitative differences in conclusions, and therefore suggest that there is need for further consideration of the magnitude of the debt-taxes relationship.

7. Summary of conclusions

In this paper we have studied the impact of tax policy on the financial decisions of a sample of unquoted Indian companies within the context of an *ad hoc* but plausible model of leverage. There are numerous important details, but the key conclusions are these. First, we find that a conventional model does a good job of explaining the leverage ratios of unquoted Indian non-financial companies. Considering the variations in accounting practise that are common among unquoted companies, this in itself is a substantial result. Second, we find that it is very important to use appropriate estimation methods. GMM substantially improves the efficiency of the estimates, in comparison with more standard panel techniques. Third, tax policy as measured has an important and generally plausible impact on leverage decisions: King's conditions all have significant and plausible coefficients. Fourth, effective tax rates and non-debt tax shields have a significant and plausible impact on financing decisions. Evaluating their precise quantitative impact is an important subject for further research. Fifth, we can trace the broad effects of the 1990s tax reforms, and we find that these reforms had a substantial impact in reducing outstanding unquoted company debt. In general, these results suggest the need for care in tax policy-making aimed at specific financial objectives in the company sector. The impact may be difficult to isolate as it will depend on the relationships among all the relevant tax variables that influence company financial decisions. Finally, we believe that these results suggest that there is need for further research on the magnitude of the impact of tax policy on debt, particularly in developing economies where little is known about this issue.

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Table 1: Theory of leverage: explanatory variables and hypothesized signs of coefficients

Explanatory variables	Mnemonic	Expected sign	References
Capital structure theory			
Asset Tangibility	*TANG*	+	Rajan and Zingales, 1995
Asset Intangibility	*INTAN*	-	Titman and Wessels, 1988
Size	*SIZE*	+ (-)	Shenoy and Koch, 1996 Ozkan, 2001
Sustainable growth prospects	*GROW*	- (+)	Hall, Hutchinson, and Michaelas, 2000 (-) Jordan, Lowe, and Taylor, 1998 (+)
Profitability	*PROF*	- (+)	Thies and Klock, 1992, (-) Jensen, Solberg, and Zorn, 1992 (+)
Business risk	*RISK*	-	Friend and Hasbrouck, 1988
Age of the firm	*AGE*	+	Wiwattanakantang, 1999
Industrial class	*IND*	±	Titman and Wessels, 1988
India			
Business group member	*BG(i)*	±	Manos, Murinde, and Green, 2001
Tax variables			
King's tax conditions	*TXDVR, TXDVE, TXEVR*	±	Chowdhury and Miles, 1989
Effective Tax rate	*TAXR*	- +	Booth, Aivazian, Demirguc-Kunt, and Maksimovic, 2001
Non-debt tax shields	*NDTS*	-	Hirota, 1999

Table 2: Characteristics of Sample Unquoted Companies

Code	Industrial Classification	no.	Ownership Groups	no.
22	Mining	1	Top 50 business houses	43
24	Non-financial services	16	Large business houses	8
31	Food & Beverages	13	Other business houses	9
32	Textiles	14	Other Indian private	37
33	Chemicals	16		
34	Non-Metallic Mineral Products	3		
35	Metals & Metal Products	5		
36	Machinery	14		
37	Transport Equipment	7		
38	Miscellaneous Manufacturing	2		
39	Diversified	6		
	Total no. of companies	**97**	**Total no. of companies**	**97**

Size in 1994 (*Rs10millon; Rs31.37=$1)*					
	Minimum	**Quartile 1**	**Median**	**Quartile 3**	**Maximum**
Net sales	3.36	20.32	38.72	77.92	1639.62
Net assets	0.56	7.74	21.88	46.34	1556.61

Table 3: Measures of leverage

Abbr	Definition
	Total liabilities or debt/total assets
GDA1	total liabilities/total assets
GDA2	(debt+trade credit)/total assets
GDA3	debt/total assets
	debt/(debt+equity+retentions)
GDER2	(debt+trade credit)/ (debt+trade credit+equity+share premia+preference+reserves & surplus)
GDER3	debt/(debt+equity+share premia+preference+reserves & surplus)
	debt/(debt+equity)
GDE2	(debt+trade credit)/(debt+trade credit+equity+share premia+preference)
GDE3	debt/(debt+equity+share premia+preference)

Table 4: Definitions of explanatory variables

X	Concept	Abbr	Sign	Definition (book values)
	Capital structure theory			
1	Asset tangibility	*TANG*	+	Fixed assets/total assets
2	Asset intangibility	*INTAN*	-	intangibles/total assets
3	Size	*SIZE*	+/(-)	Ln(real net sales) [= (sales - indirect taxes)/consumer price index]
4	Growth opportunities	*GROW*	-/(+)	= (EBITDA/book equity (t-1))*(retained earnings /EAT) = 0 if EAT = 0
5	Profitability	*PROF*	-/(+)	EBITDA/assets (t-1)
	Business risk	*RISK*	-	Normalized absolute residuals from regression of real value added on time: $\lvert (VA/P - \hat{a}_0 - \hat{a}_1 T)/\hat{a}_0 \rvert$ *VA* = sales - indirect taxes - wage costs; *P* = consumer price index
6	Positive risk	*RISKP*	-	= RISK if $a_1 > 0$; = 0 otherwise (positive time trend)
7	Negative risk	*RISKN*	±	= RISK if $a_1 < 0$; = 0 otherwise (negative time trend)
8	Age of the firm	*AGE*	+	number of years since incorporation
9	Industrial class	*IND(i)*	±	dummy variable for industry group
	India			
10	Business group	*BG(i)*	±	dummy variable for group type
	Tax, non-debt tax shields			
12	King: debt-equity	*TXDVE*	+?	(1 – i)(1 - s)/((1 - t)(1 - m)) - 1
13	King: debt-retentions	*TXDVR*	+?	(1 – i)/((1 - t)(1 - z)) - 1
14	King: equity-retentions	*TXEVR*	±	(1 - m)/((1 - s)(1 - z) - 1
15	Effective tax rate	*TAXR*	-/+	corporate tax/EBT (= 0 if EBT = 0)
16	Total NDTS - export profits	*NDTS*	-	(EBTDA - taxes/corporate tax rate)/total assets

Notes:

Unless otherwise shown, all variables are measured contemporaneously with leverage.
EBITDA: Earnings before interest, tax, depreciation and amortization
EBTDA: Earnings before tax, depreciation and amortization
EBT Earnings before tax
EAT:Earnings after tax
Flows are annualized by: *12/no of months in accounting year

Table 5. King's Tax Conditions

Years to end-March	**top rates**		
	D-E	**D-R**	**E-R**
1989	1.1739	1.1739	0
1990	1.1739	1.1739	0
1991	0.8519	0.8519	0
1992	1.0725	1.0725	0
1993	1.0725	1.0725	0
1994	1.0725	1.0725	0
1995	0.8519	0.5873	-0.1429
1996	0.8519	0.5873	-0.1429
1997	0.7544	0.3158	-0.25
1998	0.1966	0.3462	0.125
1999	0.1966	0.3462	0.125

Notes:

D-E: Debt-equity margin given retentions $(1 - i)/((1 - t)(1 - m)) - 1$;
D-R: Debt-retentions margin given equity $(1 - i)/((1 - t)(1 - z)) - 1$;
E-R: Equity-retentions margin given debt $(1 - m)/(1 - z) - 1$.

z = capital gains tax rate, t = corporate profits tax rate, m = marginal tax rate on dividends, i = marginal tax rate on debt interest

Table 6. Panel Diagnostics

Test	GDA1	GDA2	GDA3	GDER2	GDER3	GDE2	GDE3	critical values:	0.99	0.975	0.95
Hetero	19.49**	13.92**	6.802**	71.93**	79.92**	22.05**	34.79**	$\chi^2(1)$	6.635	5.024	3.841
Firm effects	1277**	1590**	1695**	1611**	1229**	1523**	1438**	$\chi^2(1)$	6.635	5.024	3.841
Time effects	0.4464	1.510	3.883*	0.7501	1.538	0.7381	1.886	$\chi^2(1)$	6.635	5.024	3.841
Hausman	23.83	17.85	6.468	46.94**	50.14**	22.62	13.25	$\chi^2(15)$	30.58	27.49	25.00
Pooling1	0.5523	0.5451	0.5462	0.4568	0.5117	0.5416	0.5832	F(261,680)	1.264	1.218	1.180
Pooling2	0.3688	0.3657	0.3756	0.3063	0.3462	0.3616	0.3962	F(333,600)	1.248	1.206	1.170

Notes

Tests are based on estimates of equation (2): $y_{nt} = \sum_h \beta_h X_{h,nt} + \sum_g \gamma_g V_{g,n} + \varepsilon_{nt}$; where H = number of company- and time-specific variables; G = number of time-invariant variables; N = number of companies; T = number of years.

Hetero: LM test for heteroskedasticity based on OLS estimates of (2), using as regressor squared fitted values of the explanatory variable; distributed as $\chi^2(1)$ under the null of no heteroskedasticity (Breusch and Pagan, 1980)

Firm: LM test for firm effects based on OLS estimates of (2) distributed as $\chi^2(1)$ under the null of no firm effects (Breusch and Pagan, 1980)

Time: LM test for time effects based on OLS estimates of (2) distributed as $\chi^2(1)$ under the null of no time effects (Breusch and Pagan, 1980)

Hausman: Hausman test for correlation between the firm effects and the explanatory variables, based on (2) excluding the time-invariant variables (V), distributed as $\chi^2(H)$ under the null of no correlation (Hausman, 1978).

Pooling1: Test for poolability over time based on (2), distributed as $F(D_1,D_2)$; $D_1 = (T-1)(H+G)$; $D_2 = NT-(H+G)T$ under the null of poolability

Pooling2: Test for poolability over time based on (2) augmented by (8) time dummies, distributed as $F(D_1,D_2)$; $D_1 = (T-1)(H+G)-8$; $D_2 = NT-(H+G)T$ under the null of poolability

* Significant at 95% level; ** Significant at 99% level.

Table 7(i). Parameter Estimates: Company- and Time-specific Variables and Tax Conditions

	OWIV	GMM Estimates						
	GDA1	**GDA1**	**GDA2**	**GDA3**	**GDE2**	**GDE3**	**GDER2**	**GDER3**
TANG	-0.1459	-0.3020	-0.2440	0.0957	0.0329	0.1121	-0.2834	-0.1110
(t)	(0.84)	(7.04)	(4.48)	(3.03)	(1.77)	(2.46)	(7.10)	(2.44)
INTAN	2.9800	-0.0158	-0.5363	0.6913	0.1908	1.0405	-0.3565	0.3597
(t)	(1.12)	(0.07)	(1.72)	(3.32)	(0.80)	(2.40)	(1.40)	(1.53)
SIZE	0.0241	0.0639	0.0576	0.0137	0.0444	0.0415	0.0611	0.0546
(t)	(0.86)	(7.15)	(8.96)	(2.32)	(8.39)	(7.50)	(7.19)	(7.84)
NDTS	0.9615	-0.3795	-0.2583	-0.4203	-0.1993	-0.1838	-0.2442	-0.1492
(t)	(0.27)	(2.48)	(2.51)	(3.00)	(2.25)	(0.90)	(2.09)	(0.94)
GROW	0.0062	0.0086	0.0099	0.0144	0.0080	0.0179	0.0086	0.0166
(t)	(0.20)	(2.68)	(4.39)	(3.73)	(4.86)	(5.77)	(3.15)	(6.00)
PROF	-0.2394	-0.1948	-0.2573	-0.1200	-0.0467	-0.1431	-0.2712	-0.3211
(t)	(2.08)	(8.18)	(14.14)	(6.50)	(2.63)	(4.37)	(12.21)	(18.41)
RISKP	-0.0098	-0.0022	-0.0027	-0.0059	-0.0017	-0.0105	-0.0023	-0.0069
(t)	(1.63)	(5.53)	(7.59)	(18.90)	(4.46)	(11.13)	(5.15)	(20.14)
TAXR	-0.2249	0.0230	-0.0048	0.0007	0.0206	0.0463	0.0084	0.0112
(t)	(0.55)	(2.08)	(0.53)	(0.07)	(2.12)	(2.92)	(0.92)	(0.95)
AGE	-0.0098	0.0000	0.0011	0.0012	0.0032	0.0025	0.0006	-0.0007
(t)	(3.00)	(0.01)	(1.32)	(1.89)	(4.69)	(2.31)	(0.74)	(0.74)
TXDVE	-0.0271	0.3666	0.2171	-0.0402	0.2081	-0.0463	0.3285	0.1144
(t)	(0.12)	(7.99)	(6.39)	(0.87)	(6.07)	(0.78)	(8.22)	(2.07)
TXDVR	0.0468	-0.2906	-0.1573	0.0567	-0.1444	0.1118	-0.2459	-0.0703
(t)	(0.22)	(7.43)	(4.71)	(1.32)	(4.90)	(2.18)	(6.56)	(1.40)
TXEVR	-0.1260	0.6721	0.3605	-0.0968	0.3896	-0.1591	0.5747	0.1718
(t)	(0.28)	(7.49)	(5.23)	(1.10)	(5.87)	(1.37)	(7.21)	(1.65)

Notes
See table 7(ii).

Table 7(ii). Parameter Estimates: Business Groups, Industry, and Diagnostics

	GMM Estimates						
	GDA1	**GDA2**	**GDA3**	**GDE2**	**GDE3**	**GDER2**	**GDER3**
BG: Top 50	0.4349	0.2682	0.1286	0.4989	0.4580	0.3176	0.2267
(t)	(2.56)	(1.93)	(1.57)	(2.67)	(2.65)	(2.25)	(1.69)
BG: "Large"	0.2030	0.2283	0.0955	0.1903	0.0611	0.2745	0.1994
(t)	(1.10)	(2.08)	(1.54)	(1.58)	(0.41)	(2.51)	(1.79)
BG: "Other"	-0.1026	-0.1353	0.0372	0.5646	0.0348	0.0903	-0.1745
(t)	(0.37)	(0.97)	(0.34)	(2.12)	(0.16)	(0.58)	(0.85)
IND: 31	0.6597	0.3114	0.2338	0.4510	0.4065	0.3972	0.3244
(t)	(3.85)	(2.20)	(2.38)	(2.86)	(2.27)	(2.78)	(2.07)
IND: 32	0.4189	0.5051	0.2603	0.0259	0.2791	0.3459	0.5373
(t)	(1.73)	(3.66)	(3.32)	(0.13)	(1.48)	(2.29)	(3.36)
IND: 33	-0.0744	0.0627	-0.0329	0.0653	-0.0930	0.0568	0.0267
(t)	(0.42)	(0.47)	(0.46)	(0.35)	(0.56)	(0.41)	(0.21)
IND: 35	0.4521	0.1977	0.1359	0.8940	0.7351	0.3580	0.1826
(t)	(1.41)	(0.82)	(0.79)	(2.69)	(2.50)	(1.47)	(0.55)
IND: 36	0.0155	0.0793	0.0537	0.0163	0.0145	0.0935	0.0945
(t)	(0.11)	(0.70)	(0.80)	(0.10)	(0.10)	(0.79)	(0.90)
IND: 37	0.3211	0.2361	0.2890	0.1976	0.2624	0.2816	0.1395
(t)	(0.68)	(0.78)	(1.47)	(0.52)	(0.70)	(0.86)	(0.42)
IND: 39	0.5295	0.5076	0.0100	0.1027	0.5541	0.4793	0.6070
(t)	(1.51)	(2.45)	(0.07)	(0.46)	(1.79)	(2.04)	(2.13)
Sargan: $\chi^2(73)$	82.6867	83.8650	80.7993	84.7507	78.3075	88.0106	82.4814
prob	(0.205)	(0.181)	(0.249)	(0.164)	(0.314)	(0.111)	(0.210)
Wald1: $\chi^2(2)$	64.22	108.32	11.37	69.26	49.35	157.60	20.81
prob	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)
Wald2: $\chi^2(3)$	16.63	31.82	10.42	14.01	10.26	24.02	21.10
Prob	(1.00)	(1.00)	(0.98)	(1.00)	(0.98)	(1.00)	(1.00)
Wald3: $\chi^2(7)$	53.97	31.82	37.87	42.09	46.46	34.60	41.61
prob	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)
N*T	970	970	970	970	970	970	970

Notes

(t) are White-corrected t statistics (White, 1980).

Sargan: is Sargan's J test distributed as $\chi^2(k)$, where k is the number of overidentifying moment restrictions (Sargan, 1958). Prob gives the probability of rejection.

Wald: is a Wald test distributed as $\chi^2(k)$; k = number of restrictions. **Wald1** tests against the null of equality among the parameters for *TXDVR*, *TXDVE*, and *TXEVR*. **Wald2** tests against the null of equality among the parameters for the 10 industry dummies. **Wald3** tests against the null of equality among the parameters for the 3 business group dummies. Prob gives the probability of rejection.

Table 8. Total Impact of Tax Changes on Outstanding Debt (Actual - Simulated: Rs10m)

Leverage measure		1991	1992	1993	1994	1995	1996	1997	1998	1999
GDA1										
debt outstanding	Rs10m	3767	4627	4932	5318	6320	7187	8282	10076	10794
change		400	861	304	387	1001	867	1095	1794	718
Tax: total effect		-164	75	82	90	-146	-174	-1711	-3172	-3494
Proportion		-0.0437	0.0163	0.0166	0.0168	-0.0232	-0.0242	-0.2066	-0.3148	-0.3237
GDA2										
debt outstanding	Rs10m	2982	3693	3822	4034	4772	5324	6881	8415	9002
change		301	711	129	212	738	552	1557	1535	586
Tax: total effect		-129	59	64	70	-188	-219	-1168	-3087	-3402
Proportion		-0.0434	0.0160	0.0169	0.0174	-0.0394	-0.0411	-0.1698	-0.3669	-0.3779
GDA3										
debt outstanding	Rs10m	1817	2227	2331	2471	2877	3299	4594	5867	6386
change		138	410	104	140	406	422	1295	1274	519
Tax: total effect		-36	16	18	18	-300	-343	-508	-1079	-1189
Proportion		-0.0197	0.0074	0.0077	0.0074	-0.1041	-0.1039	-0.1107	-0.1838	-0.1862
GDE2										
debt outstanding	Rs10m	2982	3693	3822	4034	4772	5324	6881	8415	9002
change		301	711	129	212	738	552	1557	1535	586
Tax: total effect		-90	40	41	42	-249	-278	-1063	-1441	-1529
Proportion		-0.0302	0.0107	0.0107	0.0104	-0.0522	-0.0522	-0.1545	-0.1713	-0.1698
GDE3										
debt outstanding	Rs10m	1817	2227	2331	2471	2877	3299	4594	5867	6386
change		138	410	104	140	406	422	1295	1274	519
Tax: total effect		-68	29	30	30	-374	-416	-797	-1703	-1827
Proportion		-0.0376	0.0131	0.0130	0.0123	-0.1299	-0.1261	-0.1735	-0.2903	-0.2861
GDER2										
debt outstanding	Rs10m	2982	3693	3822	4034	4772	5324	6881	8415	9002
change		301	711	129	212	738	552	1557	1535	586
Tax: total effect		-158	73	78	84	-231	-268	-1629	-3550	-3919
Proportion		-0.0530	0.0197	0.0205	0.0209	-0.0484	-0.0503	-0.2368	-0.4218	-0.4353
GDER3										
debt outstanding	Rs10m	1817	2227	2331	2471	2877	3299	4594	5867	6386
change		138	410	104	140	406	422	1295	1274	519
Tax: total effect		-68	31	34	37	-168	-195	-688	-1909	-2133
Proportion		-0.0375	0.0139	0.0145	0.0148	-0.0586	-0.0592	-0.1498	-0.3253	-0.3340

Notes

Debt outstanding: is the actual total debt outstanding for all sample companies

Change: is the year-to-year change in debt outstanding

Tax: total effect: is the cumulative impact up to the current year of tax changes made in all budgets from 1990 through the preceding year.

Proportion: is the ratio of the total tax effect to debt outstanding

Table 9. Year-by-Year Impact of Tax Changes on Outstanding Debt (Actual - Simulated: Rs10m)

Leverage measure	year of tax change	1991	1992	1993	1994	1995	1996	1997	1998	1999
GDA1	1990	-164	-62	-68	-75	-176	-204	-610	-959	-1057
	1991		137	150	165	115	129	-231	-501	-551
	1994					-85	-99	-492	-816	-899
	1996							-377	-676	-745
	1997								-220	-242
	Total	**-164**	**75**	**82**	**90**	**-146**	**-174**	**-1711**	**-3172**	**-3494**
GDA2	1990	-129	-49	-53	-59	-163	-188	-444	-871	-961
	1991		108	118	129	66	74	-146	-512	-563
	1994					-91	-105	-350	-758	-836
	1996							-229	-612	-674
	1997								-334	-368
	Total	**-129**	**59**	**64**	**70**	**-188**	**-219**	**-1168**	**-3087**	**-3402**
GDA3	1990	-36	-13	-15	-17	-128	-146	-196	-330	-364
	1991		30	33	35	-64	-74	-114	-231	-254
	1994					-107	-123	-169	-297	-328
	1996							-29	-128	-141
	1997								-93	-102
	Total	**-36**	**16**	**18**	**18**	**-300**	**-343**	**-508**	**-1079**	**-1189**
GDE2	1990	-90	-32	-34	-36	-143	-159	-374	-479	-508
	1991		72	74	78	-6	-8	-192	-264	-280
	1994					-100	-111	-316	-410	-436
	1996							-180	-250	-265
	1997								-38	-40
	Total	**-90**	**40**	**41**	**42**	**-249**	**-278**	**-1063**	**-1441**	**-1529**
GDE3	1990	-68	-24	-25	-28	-169	-189	-305	-515	-553
	1991		53	55	58	-68	-75	-164	-346	-372
	1994					-137	-152	-259	-460	-494
	1996							-69	-232	-249
	1997								-149	-160
	Total	**-68**	**29**	**30**	**30**	**-374**	**-416**	**-797**	**-1703**	**-1827**
GDER2	1990	-158	-60	-64	-71	-198	-226	-599	-1041	-1149
	1991		132	143	156	78	86	-224	-587	-647
	1994					-111	-128	-481	-898	-992
	1996							-326	-710	-784
	1997								-314	-347
	Total	**-158**	**73**	**78**	**84**	**-231**	**-268**	**-1629**	**-3550**	**-3919**
GDER3	1990	-68	-26	-28	-31	-109	-126	-266	-540	-603
	1991		56	62	68	12	13	-97	-333	-371
	1994					-71	-82	-213	-474	-530
	1996							-112	-350	-392
	1997								-212	-237
	Total	**-68**	**31**	**34**	**37**	**-168**	**-195**	**-688**	**-1909**	**-2133**

Notes

Each entry gives the impact on total debt outstanding that can be attributed in any year to each budget. The total is the sum of individual budget effects and is the same as the "Tax: total effect" in table 8.

Appendix: Instrument Set for GMM Estimation

The instrument matrix, Z can be written more fully as:

$$Z = \begin{bmatrix} z_1 & 0 & \cdots & 0 \\ 0 & \ddots & & \vdots \\ \vdots & & z_{T-1} & 0 \\ 0 & \cdots & 0 & z_T \end{bmatrix} \qquad \ldots A1$$

Each z_t ($t = 1,...,10$) is the instrument set for the corresponding cross-section equation. We use the assumption that the correlation between the exogenous variables (X_1) and the company effect (μ) is constant over time. Using the notation $Z_{i,t\text{-}j}$ to refer to vectors of instruments, and Q to refer to the within-group operator, the z_t can be written as follows:

$$z_t = \left[Z_{1,t}, Z_{2,t-1}, Z_{3,t}\right]; \qquad t = 1$$

$$z_t = \left[Z_{1,t}, Z_{2,t-1}\right]; \qquad t = 2,...,9$$

$$z_t = \left[QZ_{1,t}, QZ_{1,t-1}, QZ_{1,t-2}, Z_{4,t}\right]; \qquad t = 10$$

where: Z_1 = *SIZE, GROW, PROF, RISKP* (“exogenous”)

Z_2 = *TANG, INTAN, NDTS, TAXR* (“predetermined”)

Z_3= *TXDVR* (tax rate)

Z_4= *AGE* (time-invariant)

Appendix Table A1. Correlation matrix of Company- and Time-Specific Variables

	GDA1	GDA2	GDA3	GDE2	GDE3	GDER2	GDER3	TANG	INTAN	SIZE	NDTS	GROW	PROF	RISKP	RISKNA	TAXR
GDA1	1.0000															
GDA2	0.8523	1.0000														
GDA3	0.5394	0.6973	1.0000													
GDE2	0.6799	0.6327	0.4316	1.0000												
GDE3	0.5754	0.6128	0.6686	0.8297	1.0000											
GDER2	0.9636	0.9469	0.6312	0.6898	0.6236	1.0000										
GDER3	0.7923	0.8525	0.8848	0.5537	0.7388	0.8535	1.0000									
TANG	-0.3144	-0.1479	0.1673	-0.1299	0.0354	-0.2445	-0.0343	1.0000								
INTAN	-0.0116	0.0358	-0.0245	-0.0550	-0.0311	0.0083	0.0131	-0.0217	1.0000							
SIZE	-0.0418	-0.0439	0.0855	-0.0343	0.0822	-0.0306	0.0279	0.0451	-0.0457	1.0000						
NDTS	-0.0836	-0.0685	0.0855	0.0074	0.0528	-0.0767	0.0010	0.1297	-0.0285	0.1757	1.0000					
GROW	0.1300	0.1144	0.1021	0.1314	0.1186	0.1270	0.1188	-0.0514	-0.0411	0.1026	0.1584	1.0000				
PROF	-0.2169	-0.1792	-0.0240	-0.1076	-0.0923	-0.2177	-0.1460	0.0405	0.0381	0.1759	0.2974	0.5696	1.0000			
RISKP	-0.0255	-0.0828	-0.1219	-0.0055	-0.0892	-0.0552	-0.1180	-0.0584	0.0125	0.0232	-0.0079	0.0590	0.1359	1.0000		
RISKN	-0.0148	-0.0353	-0.0589	-0.0279	-0.0241	-0.0165	-0.0233	-0.0474	-0.0742	-0.1881	-0.1326	-0.0728	-0.2037	-0.1035	1.0000	
TAXR	-0.0261	-0.1256	-0.2100	0.0325	-0.0487	-0.0777	-0.1678	-0.2893	-0.0809	-0.0359	0.2529	0.0295	0.1892	0.0532	-0.0897	1.0000

Footnotes

1 Quoted firms may not necessarily adhere to exchange disclosure requirements. This has been an issue for the Bombay Stock Exchange (BSE), but non-compliance can lead to suspension of the shares by the BSE. We are indebted to an anonymous referee for this point.

2 In a related paper we investigate the impact of tax policy on a sample of quoted companies: Green and Murinde (2003).

3 For a general overview of India in the 1990s, see the collection of essays in Ahluwalia and Little (1998), especially Singh (1998).

4 King was analysing the then-current UK corporate tax system. Thus, he did not distinguish between the tax rates on dividend and interest income. However, King's original conditions are easily amended to arrive at the formulas given in the text.

5 Booth, Aivazian, Demirguc-Kunt, Maksimovic used the effective tax rates in a set of individual country regressions. However, in a separate cross-country regression they used instead King's debt-equity condition.

6 Allowing for loss carryovers, a simple dichotomous (Plesko) or trichotomous (Graham) variable is a good approximation to the 'true' simulated marginal rate in the US.

7 Firms which reported negative net worth were technically bankrupt under Indian law. Such firms, once registered, with the statutory Board for Financial and Industrial Reconstruction as "sick", effectively cease operations until a reorganisation plan is proposed and agreed by the Board. For further details see Goswami (1996) and (2000). We are indebted to an anonymous referee for this point.

8 Data corresponding to account years of between 7 and 11 months were adjusted to a 12 month basis. However, the regressions were also run separately using the unadjusted data and there were no major differences in the results.

9 For example, company size was calculated by deflating sales by the consumer price index. Companies reporting at end-March were deflated by the March consumer price index, those reporting at end-June were deflated by the June price index and so on.

10 These figures may somewhat exaggerate the importance of business groups for two reasons. First, reporting standards within a group are likely to be superior to those within stand-alone companies. Thus, our sample selection procedure may over-represent group companies. Second, since most Indian companies do not produce consolidated accounts, some companies which, according to our data, belong to a business house may in fact be majority-owned subsidiaries.

11 All our data are measured at book value as there are evidently no market value data available for unquoted companies.

12 For example, provisions for tax and dividends are funds set aside from the current financial year, but they are paid in the following year.

13 The more commonly-used market-to-book ratio is not applicable here as, by construction, we have no market values.

14 Value added is preferred to profits because reported profits may contain idiosyncratic components which are unrelated to business activity during the accounting year. Value added is a better reflection of underlying economic profit.

15 The material in this section is derived particularly from: Income Tax Department (2001), Institute of Chartered Accountants of India (2000), Price Waterhouse (1996) and Taxmann's Companies Act (2000).

16 The tax year runs from April to end-March. A distinction is made between the assessment year and the financial year. Income accrued in any given financial year is taxed at the rates applicable to that year. However, the tax for that year is assessed and payment finalized in the following year, which is the assessment year. Dates in the text refer to financial years ending in March.

17 The top rate of tax became payable at annual incomes of Rs100,000 through 1992; Rs120,000 through 1997; and Rs150,000 thereafter.

18 Two further features of company taxation not modelled in this paper are as follows. First, closely-held companies were subject to a higher rate of tax than more widely-held public companies until April 1994 when the rates were unified. Second, since April 1996, companies have been subject to a Minimum Alternative Tax. This is levied if the taxable income of a company calculated according to the standard provisions of the tax act is less than 30% of its book profits.

19 Long-term gains are those on assets held for more than 3 years (one year for listed securities or mutual fund units). Gains on assets held for a shorter period and those on which depreciation is charged are short-term.

20 R&D is only available for a subsample of firms; export profits are not reported at all; and book depreciation may bear only a tenuous relationship to tax depreciation. We initially used estimates of depreciation and export profits in the model, but their coefficients were mostly positive, suggesting mis-specification. We therefore aggregated all non-debt tax shields as explained in the text.

21 Ziliak studied a sample of 5320 observations.

22 A full set of OWIV estimates is available from the authors on request.

23 The exceptions, GDA3 and GDE3, are mostly not significant.