How Elastic is the Corporate Income Tax Base?

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The federal government of the United States primarily finances its expenditures from income taxation, at both the individual and corporate level. Traditionally, corporate income taxation was about half as large as individual income taxation as a source of federal revenue; today, the ratio of corporate tax revenues to individual tax revenues is only about 15%. Nevertheless, a large economics literature continues to consider the corporate tax as a primary determinant of corporate behavior in the U.S. Numerous articles have addressed the impact of the corporate tax on corporate investment and financing.

Oddly, this literature has not addressed directly the question of how sensitive the base of corporate income taxation is to the corporate tax rate. Past literature has addressed pieces of this question, but there is no clear estimate that emerges from past work. As emphasized by Saez (2004), what determines the ultimate efficiency of a tax system, absent external effects of taxation, is the elasticity of the base of taxable income with respect to the tax rate. Indeed, a large literature has arisen in public economics devoted to estimating this elasticity with respect to the individual income tax system. Yet there is no comparable work on corporate taxation.

In this paper, we estimate the impact of the corporate tax rate on the level of corporate taxable income. An obvious difficulty with such an exercise is that the tax rate itself is determined by the level of taxable income. Thus, a regression of taxable income on tax rates will suffer from potential reverse causality.

We address this problem by following the approach applied by Gruber and Saez (2002) to the analysis of the impact of the tax rate on the individual income tax base. In particular, we model the effective tax rates faced by firms in one period, and the effective tax rate that would be faced by firms *with that same income* in the next period. The difference between these two is exogenous to the firm's behavior. This forms a natural instrument for a regression of the change in taxable income as a function of the change in effective tax rates.

We carry out this exercise using data from Compustat. This provides longitudinal data on the universe of publicly-traded firms in the U.S., allowing us to model the change in taxable income as a function of the change in tax rates. These data have the weakness, however, of being accounting-based rather than tax-based. They also lack information on a host of tax credits used by corporations, and consist only of publicly traded firms. In future work, we therefore plan to extend this analysis to incorporate tax data from IRS industry-level files.

We find strong evidence that the corporate tax base is elastic with respect to the marginal effective tax rate. Our central estimate is that the elasticity of the corporate tax base with respect to the rate is –0.2. This is a fairly small elasticity relative to those found for individual income taxation. Absent external effects, this suggests that the inefficiency of corporate taxation may be lower than that of individual income taxation.

Our paper proceeds as follows. In Part I, we review the relevant literature on corporate and individual income taxation. In Part II, we describe our data and the construction of our key measures. Part III discusses our regression approach. Part IV presents our results, and Part V concludes.

Part I: Literature Review

Corporate Taxation and Corporate Tax Revenues

As noted above, there is no work of which we are aware that directly assesses how changes in the effective corporate tax rate affects the size of the corporate tax base. There is, however, a huge body of work that speaks to aspects of this relationship. In this section, we provide a brief review of those literatures.

A large number of studies assess the impact of corporate taxation and the user cost of capital on investment decisions. This literature is obviously relevant because if a higher tax rate leads to less investment, it may lead to lower corporate tax revenues in the long-run. The conclusions of this literature are varied. Goolsbee (1998a) finds that most of the benefit of tax incentives go to capital suppliers through higher prices, explaining traditionally small investment elasticities. Auerbach and Hassett (1992) estimate an elasticity of equipment investment with respect to the user cost of capital of approximately –0.25, whereas the results of Cummins, Hassett and Hubbard (1994, 1996) and Caballero, Engel and Haltiwanger (1995) imply elasticities of –0.5 to –1. Recent attention has also been paid to the bonus depreciation rules of 2002 and 2003, with the literature finding generally modest effects (see Goolsbee and Desai (2004) and House and Shapiro (2004)).

There is also a large number of studies which assess the impact of corporate taxation on corporate financing decisions. Once again, this literature is relevant because if higher tax rates cause firms to shift to forms of financing which are tax favored, it will lower the firm's tax burden. In the equilibrium of Miller (1977), taxes are irrelevant to the form of finance for all but the marginal firm. Empirical studies have found mixed evidence of tax effects on financial policy. Mackie-Mason (1991) demonstrates an effect of tax loss carryforwards on the marginal financing decision, but Graham (2000) suggests that substantial tax benefits are left unused and that from a tax perspective, debt policy is pervasively conservative.

A number of studies have also investigated the impact of corporate taxation on the incorporation choice and the choice of corporate form. Economic activity which is not incorporated is taxed at individual income tax rates. Incorporated firms may organize in a variety of forms, some of which (such as S corporations) avoid the corporate entity-level tax, whereas others (such as C corporations) must pay corporate tax on corporate earnings.

If incorporated entities cannot escape the corporate tax, then as the corporate tax rate rises relative to the individual tax rate it may cause economic activity to be shifted from the corporate to the non-corporate sector. This organizational form response margin has been modeled by Gravelle and Kotlikoff (1989), who show that excess burdens can be quite large if less efficient noncorporate production is substituting for more efficient corporate production. Goolsbee (1998b) and Gordon and Mackie-Mason (1994, 1997) find relatively small elasticities of substitution between the corporate and non-corporate sector. Goolsbee (2004), however, finds much larger responses of organizational form to tax rates using cross-sectional data — an increase in the corporate tax rate by 10 percentage points reduces the corporate share of firms in a state by 0.25, and his results suggests that organizational form is in fact a more important adjustment margin than the firm's operations.

Incorporated firms may respond to tax policy by electing to organize as S corporations rather than C corporations. Plesko (1994) found that firms were more likely to organize as S-corporations after TRA86, and Carroll and Joulfaian (1997) estimate a tax elasticity of 0.2 for the probability of a firm electing to be an S-corporation. Firms that are publicly traded are required to have C corporation status, placing an effective limit on this response margin.

The Elasticity of Individual Taxable Income

In contrast to corporate income taxation, there is a burgeoning literature on the elasticity of the individual income tax base to individual income taxation; a very recent comprehensive review of this literature is provided by Giertz (2004). This literature grew out of early work by Lindsay (1987) and Feldstein (1995). The literature has evolved to deal with a number of difficult issues, such as the fact that changes in taxation by income group may be correlated with other underlying trends in taxable income that are unrelated to the tax system.

The broad consensus from this literature is that the elasticity of taxable income with respect to the tax rate is roughly 0.4. Moreover, the elasticity of actual income generation through labor supply/savings, as opposed to reported income, is much lower. And most of the response of taxable income to taxation appears to arise from higher income groups. An important recent contribution is Kopczuk (forthcoming), who shows that the elasticity of taxable income to tax rates is a function of the elasticity of the tax base: when the tax base is less fungible, taxable income is less elastic.

Why Does this Parameter Matter?

Saez (2004) provides a useful framework for interpreting this literature. He highlights that, absent any external effects of tax changes, the full welfare consequences of a tax change are summarized by the impact on the base of taxable income. For example, unless there is some additional social cost to individuals working less hard, the full welfare cost of higher labor taxes can be represented by the resulting decline in labor income.

In the context of both individual and corporate income taxation, a major source of such externalities can be spillovers to other tax systems. When the corporate income tax rate rises, then individuals might avoid incorporation and therefore report more income within the individual income tax system. In this way, the elasticity of the corporate tax base with respect to the corporate tax rate overstates the welfare costs of corporate taxation. A similar issue arises with individual income taxation. In absolute dollar terms, the externalities are symmetric under the two systems. However, as a percentage of the total base of revenues, this externality will be proportionally larger in the corporate tax system.

Other externalities are harder to quantify. If, for some reason beyond tax wedges, the social return to investment is above its private return, then corporate taxation could have large welfare costs even with a modest decline in corporate taxable income. There is a large debate on this point, but certainly no consensus for external returns to investment.

Thus, the elasticity of the corporate tax base with respect to the corporate tax rate seems a natural place to start for assessing the welfare consequences of corporate taxation. Additional work beyond this paper will clearly be necessary to consider the external effects of corporate taxation and whether they, on net, change the conclusions of our analysis.

Part II: Methodology and Data

This section reviews and motivates the use of the marginal effective tax rate (ETR), discusses the data, and presents the construction of the ETR and the instruments. It also reviews the important corporate tax law changes that are the source of our variation in marginal tax incentives.

The Marginal Effective Tax Rate

The marginal effective tax rate is defined as the share of the firm's required return on capital that goes to the federal government rather than to investors (Fullerton (1984)). The marginal effective tax rate is to be distinguished from what in the accounting literature is called the (average) effective tax rate, which is taxes paid divided by a measure of income. We refer to the marginal effective tax rate as simply the effective tax rate or ETR. The ETR captures features of the tax code such as the present discounted value of depreciation allowances and investment tax credits, as well as the statutory marginal tax rate.

Our measure of the effective tax rate is closest in spirit to the King and Fullerton (1984) application of Hall and Jorgenson (1967): for each firm and its chosen capital structure we estimate the ETR for each type of capital asset separately. One major difference is that we do not account for shareholder taxes. Our construction can also be compared to Gravelle (1994, 2001), who constructs marginal effective tax rates at the industry level, although our constructions also allow discount rates to reflect financing choices at the firm (and hence industry) level. Gravelle (2001) shows that these types of effective tax rates display substantial variation by industry over time. Auerbach (1983) illustrates that differential asset taxation results in a social cost of misallocated capital, and that this cost has varied over time.

This is of course not the only possible way to measure the effective tax burden on firms. Gordon, Kalambokidis and Slemrod (2003) review several possible ways of measuring the marginal effective tax rates and propose an alternative measure based on the difference between the tax collected under existing rules and hypothetical tax collected under the nondistortionary R-based tax (as in Gordon and Slemrod (1988)). This alternative measure may capture some complications omitted by the more traditional ETR, and in future work on this topic could be considered as an alternative to the traditional ETR.

In its most basic form, the traditional ETR is written as

$$ETR_t = \frac{f'(k_t) - \delta - \rho_t}{f'(k_t) - \delta}, \qquad (1)$$

where ρ is the required return on capital (or after-tax discount rate) that is ultimately demanded by investors, δ is economic depreciation, and $f'(k)$ is the marginal product of capital. In calculating the effective tax rate, it is usually assumed (as in Hall and Jorgensen (1967)) that firms set the marginal product of capital equal to the implicit rental value of capital services:

$$f'(k_t) = \frac{(\rho_t + \delta)(1 - ITC_t - \tau z_t)}{(1 - \tau_t)}. \qquad (2)$$

Here, ρ and δ are as before, τ is the relevant statutory marginal tax rate, ITC_t is the investment tax credit per dollar as of time t, and z_t is the present discounted value of depreciation allowances as of time t. These derivations are reviewed in Gravelle (1982a, 1982b) and Fullerton (1987, 1999).

Data

The data for this exercise come from several sources. Financial data for 1960-2003 were extracted from the Compustat industrial, full coverage and research files. This is the broadest available source of annual data on publicly traded companies and is compiled by Standard & Poor's from corporate financial statements. Since the main variation in the tax code that we exploit takes place at the industry level, the tax and income variables constructed from the Compustat data are averaged or aggregated to the industry level for our regression analysis. This procedure also avoids the problem of the rather substantial number of firm-year observations for which taxable income is zero (approximately 10% of the sample overall and approximately 25% after TRA86).

The use of Compustat for these purposes presents two major challenges. First, the sample does not represent the entire corporate sector. It consists only of C corporations, and only those C corporations whose stock is publicly traded. Although the incidence of firms actually going private and exiting the Compustat database is not large, the estimates in this paper must be taken as representing only the effects of the corporate tax code on the behavior of publicly traded C-corporations.

The second challenge is the fact that Compustat only reports income as presented by the corporation in its financial statements. Taxable income and the gross income for the purposes of tax books are not reported. The problem of inferring taxable income from financial statements is discussed in Plesko (2003), Manzon and Plesko (2002), Mills and Plesko (2003), and Hanlon (2003). We follow Stickney and McGee (1982) and define taxable income as pretax book income (before interest) minus the deferred tax expense divided by the statutory marginal tax rate. We calculate taxes paid as the total tax expense minus the deferred tax expense.

In future work we intend to use an industry-level panel of tax data from the IRS Statistics of Income division to confirm and deepen the analysis undertaken in this paper. This dataset, currently under construction, will allow us to include firms of all organizational forms, and will contain industry-year level aggregates for taxable income as reported to the IRS.

Compustat does not contain sufficient information on the activities of each firm to derive an estimate of the present discounted value of the firm's depreciation allowances. We rely on benchmark input-output accounts from the Bureau of Economic Analysis (BEA) at the industry level to measure the extent to which a change in depreciation allowances affects a firm in a given industry. These matrices are published approximately every five years by the BEA and are obtainable at the level of the BEA's 2-digit industry classification for 1958, 1963, 1967, 1972, 1977, 1982, 1987, 1992, and 1997. Each firm in our analysis was assigned a BEA 2-digit output industry based on its 4-digit Compustat industry code, and the vector of capital inputs for that output industry in the last published year prior to the observation was assigned to the observation. In other words, for a given observation, we always use the lagged vector of capital shares used by firms in that industry. We renormalized the vector of inputs to reflect only capital inputs, not raw materials. (We explored alternative constructions using the BEA's capital flow tables, but these were not available as frequently as the input-output tables and their industry categories were less consistent.) Finally each different type of capital input was matched to one of the standard 28 asset categories used by the BEA. These are the same 28 asset categories used in Hulten and Wykoff (1981), Cummins, Hassett and Hubbard (1994), and Gravelle (1994, 2001).

The combination of a firm's output industry, the vector of capital inputs used by that industry, and the asset category that each capital input belongs to creates a mapping between each firm and the share of its capital in each of the 28 different asset types. For each year we also collected and coded annual corporation income tax brackets and rates from the IRS (2003), annual nominal corporate bond rates from the Federal Reserve, and annual inflation rates from the Bureau of Labor Statistics.

Constructing Effective Tax Rates

Our ultimate unit of analysis is the 2-digit SIC industry level. We analyze the data at this level because a key input into our effective tax rate, for computing the value of depreciation deductions, is the asset mix. While we know the capital structure (debt/equity ratio) of the firm and can approximate its taxable income, the only information about the asset mix is the imputation based on industry-level data as described above. Using this imputation we create effective tax rates at the firm level, and then aggregate back to the industry level for analysis. At the firm level, assuming a constant asset mix could result in biases due to measurement error.

We proceed as follows. Each of the 28 asset categories is matched to economic depreciation rates, taxable asset lives, depreciation rules, and investment tax credit (ITC) rules using the tables in Gravelle (1994). This gives us a vector of tax treatments by asset category. Effective tax rates are then calculated for each firm for each of the 28 BEA asset categories, and weighted using the vector of capital usages for that firm's industry. Finally, these firm level effective tax rates are averaged to the 2-digit SIC level for our regression analysis.

Combining equations (1) and (2), the ETR for asset category (*j*) at firm (*i*) in year (*t*) is

$$ETR_{it}^{(j)} = \frac{[(\rho_{it} + \delta_j)(1 - ITC_{jt} - \tau_{it} z_{jt})/(1 - \tau_{jt})] - \delta_j - \rho_{it}}{[(\rho_{it} + \delta_j)(1 - ITC_{jt} - \tau_{it} z_{jt})/(1 - \tau_{jt})] - \delta_j} . \quad (3)$$

This calculation parallels that of Gravelle (1994, 2001). The discount rate ρ_{it} depends on the firm's capital structure. Letting α be the share financed from debt,

$$\rho_{it} = \alpha_{it}(r_t^D(1 - \tau_{it}) - \pi_t) + (1 - \alpha_{it})r_t^E , \quad (4)$$

where r^D is the AAA corporate bond rate, r^E is calculated assuming a 4% equity premium, and π_t is the inflation rate in year *t*. Investment tax credits, statutory marginal tax rates, and economic depreciation rates are collected and applied as described above.

The calculation of the present discounted value of depreciation deductions (*z*) for asset category (*j*) at time (*t*) is a function of the asset recovery rules specified by the tax code in year (*t*). These rules are tabulated for Gravelle (1994) for most years, though we also augment them with the bonus depreciation of 30% implemented for 2002 and 50% implemented for 2003. The possible asset recovery rules consist of straight line, sum of year digits, double declining balance, 150% double declining balance, 175% double declining balance, and variations on these that allow for the 30% or 50% bonus depreciation. The present value calculations are based on the formulas in Hall and Jorgensen (1967), extended to allow a flexible rate of declining balance and for the immediate expensing of a portion of the investment under the bonus depreciation. So for a given bonus depreciation α (e.g. 30% in 2002), a declining balance *n* (e.g. 2 for equipment in 1981), an asset life *T* and a nominal interest rate ρ, the present discounted value of depreciation deductions for a given asset class and year is

$$z = \alpha\left(\frac{1}{1+\rho}\right) + (1-\alpha)\left\{\frac{(n/T)}{\rho+(n/T)}\left[1-e^{-(\rho+(n/T))T^*}\right] + \frac{e^{-(n/T)T^*}}{\rho(T-T^*)}\left[e^{-\rho T^*} - e^{-\rho T}\right]\right\}, \quad (4)$$

where $T^* = T/n$.

In summary, the effective tax rate calculation for each asset category are essentially as in Gravelle (1994, 2001) but they also reflect variation in marginal tax rates resulting from differences in taxable income and capital structure shares at the firm level, and incorporate some of the more recent tax changes. Note that in these constructions τ is the current statutory rate faced by the firm, which is zero if the firm has no taxable income or has a taxable loss. An alternative construction is to assume that the statutory rate returns to the top bracket level the following year. This changes effective tax rates for firms running operating losses but does not change the general distribution of the estimated effective tax rates. The appropriateness of the use of the current marginal tax rate in this calculation depends on the extent of mobility out of the state of tax exhaustion (see Auerbach (1983) and Altshuler and Auerbach (1990)).

One notable complication is the corporate alternative minimum tax (AMT), which is not included in the classical definition of the effective tax rate (ETR). This is problematic, as the alternative minimum tax does alter the tax schedule for firms that take large amounts of deductions, and this was particularly the case during the 1987-1997 after the implementation of the AMT but before the 1997 changes that brought AMT depreciation deductions more in line with those of the rest of the tax system. Marginal incentives to invest may be affected by the AMT in ways that are not captured by the ETR. On the other hand, to the extent that the AMT broadens the tax base by disallowing deductions it should perhaps generate lower elasticities with respect to the corporate tax rate, if the arguments of Kopczuk (forthcoming) carry over to a corporate setting.

This measure of the effective tax rate is "myopic" in the sense that we assume firms base expected future values of their marginal tax rates on their current values. A more sophisticated measure would account for the fact that firms expect changes to occur in the marginal tax rate, and in that case the present value of depreciation deductions would depend on the expected path of statutory tax rates rather than the current rate. Auerbach and Hines (1988) offer one way of accounting for expectations of changing tax policy by calculating moving averages of future realized costs of capital with weights declining as the time horizon gets longer. Furthermore, if there are large adjustment lags, lagged costs of capital are also useful in this context. Given the difficulties with measuring the expected future cost of capital, we focus in this paper on the one-period myopic user cost of capital but caution that more sophisticated models should account for the fact that firms have expectations over future tax parameters.

Table 1 shows mean marginal effective tax rates by consolidated industry categories. The table illustrates that there is substantial variation in the effective tax rate both across industries, and within industries over time. Consider the case of Chemical, Plastic and Drug manufacturing. This industry had one of the highest effective tax rates in the 1960s and early 1970s, but one of the lowest during the mid-1970s through early 1980s, then returned to an above-average tax rate by the late 1980s. Note that for illustrative purposes, the industry categories in this table are more consolidated than those in our regressions where the standard 2-digit industry categories are employed.

In addition to considering the effects of marginal effective tax rates on taxable income, we also test for effects of the simple marginal tax rate on an extra dollar of currently earned income. This latter rate is simply the federal statutory rate if the firm is has positive taxable income and zero if it has zero or negative taxable income. As with the ETR, we create this rate at the firm level, and then aggregate back to the industry level for analysis. The simple marginal tax rate on an additional dollar of earned or reported income does not capture the effects of depreciation allowances or investment tax credits on the marginal tax burden. However, firms can change taxable income directly through means unrelated to investment, for example by increasing leverage to make higher interest payments or by various methods of tax avoidance such as moving income offshore. The marginal tax rate on an additional dollar of earned income defines the firm's incentives to engage in these activities.

Section III: Empirical Approach

Regression Framework

Gruber and Saez (2002) derive an equation for relating the change in marginal tax rates to the change in taxable income. Following their derivation, we estimate equations of the form:

$$\log\left(\frac{y_{h,t+1}}{y_{h,t}}\right) = \alpha_t + \beta \log\left(\frac{1-ETR_{h,t+1}}{1-ETR_{h,t}}\right) + \varepsilon_{h,t}\ , \qquad (5)$$

where y is taxable income, α_t is a year effect, *ETR* is the effective tax rate constructed as described in the previous section, and each h represents an industry.

In this equation, the coefficient β estimates the effect of a one percent change in the after-tax earnings on a dollar of investment in terms of percent changes in taxable income. A coefficient of zero indicates that taxable income does not respond to changes in tax rates; a coefficient of one indicates that for every percent increase in after-tax earnings, after-tax income rises by one percent. All estimates are weighted by industry-aggregate firm size (assets) so that the estimates more closely reflect the relative contribution to total revenues; the results are very similar if we instead weight by sales.

Of course, a problem with such a regression is that common factors determine both effective tax rates and taxable income, such as firm's mix of productive assets or capital structure. Thus, an equation such as (1) is not identified. We address this concern by following the instrumental variables strategy of Gruber and Saez (2002). For each pair of years t and $t+1$, we compute the ETR for both years using the same set of constant firm characteristics from year *t*, but allowing tax rules and macroeconomic factors to change. The difference between these sets of ETRs is correlated with the change in the actual ETR, but is uncorrelated with any changes in firm decisions.

As Gruber and Saez (2002) highlight, however, there remains an important identifying assumption with this approach: that lagged characteristics of the firm do not affect the change in taxable income. This was a particularly important concern in the context of studying the tax reforms of the 1980s at the individual level. These reforms reduced tax rates at the top of the income distribution in particular, so that the instrument in that context was showing a particular decline in tax rates for high income taxpayers. But the income distribution was widening over this same interval, so that high income taxpayers were seeing a rise in their taxable income independent of tax reform. As a result, the instrument was naturally correlated with the change in taxable incomes.

To address this concern, Gruber and Saez (2002) suggest including detailed controls for lagged taxable income. In this way, any underlying trends correlated with lagged characteristics will be captured. Thus, we include in our regression specification a ten piece spline in lagged taxable income.

Given this instrumental variables strategy and the included controls, the identification of the ETR effects in our empirical model comes from two sources: the differential effects of tax law changes and macroeconomic factors across firms. To be clear, since our models include year dummies, the overall effects of tax reform and macroeconomic changes are purged from the model, and identification only comes from differential impacts of these changes across firms.

The appendix table outlines the tax law changes that affect the ETR and that are incorporated into our model. The tax brackets changed numerous times over the years 1960 to 2003. These bracket changes apply to all firms and there is relatively little graduation of the corporate income tax rate, especially relative to the personal schedules. However, firms often have zero taxable income, and so there is cross-sectional variation in the extent to which they are affected by rate changes. There have been numerous changes in depreciation rules, notably the liberalization of asset lives effective in 1971, the implantation of accelerated cost recovery system (ACRS) accounting in 1981, the modification of these by the 1982 tax act, the implementation of the modified accelerated cost recovery system (MACRS) accounting through TRA86, the changes in structure lives in the 1993 legislation, and the bonus depreciation in the 2002 and 2003 tax laws. There have also been many changes to the investment tax credit over time, beginning with the Kennedy era laws and culminating with the repeal of the investment tax credit in the 1986 legislation.

Figure 1 illustrates the variation across firms in the effective tax rate over time. This figure shows the effective tax rate at the mean, and at the 25^{th}, 50^{th} and 75^{th} percentiles of the effective tax rate distribution. There was very little effective tax rate variation across firms until the 1961 tax reforms, which opened up some variation across firms. This variation then narrowed again through the late 1960s and early 1970s, until the major liberalization of asset lives in 1972, which led to enormous increases in variation in effective tax rates across firms. This variation was then considerably narrowed by the Tax Reform Act of 1986, although the 25^{th} percentile of firms still had an effective tax rate of zero while the 75^{th} percentile had an effective tax rate of the statutory 34%. Finally, recent tax reforms combined with depressed levels of corporate profits have substantially reduced effective tax rates to zero at the median. Figure 2 shows this distribution at the industry level where we conduct our analysis. The distribution is somewhat more compressed but the patterns remain broadly similar as would be expected.

IV. Results

Table 2 reports the basic results of our analysis. In all regressions, we cluster the standard errors at the industry level, following the strategy suggested by Bertrand et al. (2004). In the first column, we show the first stage relationship between our instrument for the change in after-tax shares and the change in those shares. There is a very strong correlation between these measures. The coefficient is 0.944, and it is very highly significant with a t-statistic of around 15.

The second column shows the instrumented regression for taxable income. We first show the results without a control for lagged taxable income. The coefficient on the change in after-tax share is 0.174, indicating that each 10% change in after-tax share leads to a rise in taxable income of 1.74%. While significant, this is a considerably smaller response than is found for individual taxable income responsiveness to tax changes. The next column includes the splines in lagged income. Controlling for these splines has a relatively small effect on the estimate, with the coefficient rising to 0.197.

In Table 3, we show the results of a similar specification but now with two explanatory tax variables: the log change in the ETR and the log change in the marginal tax rate on an additional dollar earned. This latter rate is simply federal statutory rate if the firm is has positive taxable income and zero if it has zero or negative taxable income. The first two columns show the first stage equations in which the log change in the tax rate measures are regressed on the log changes calculated based on time *t* characteristics and time *t+1* rules. The last two columns show the results of the IV estimation. Without controls for the spline in taxable income, the ETR coefficient is almost identical to its value in Table 2, although it is now less statistically significant (t-statistic of 1.64). When the spline in taxable income is included as a control, the coefficient value and standard error are both slightly larger than in Table 2.

The statutory marginal tax rate appears with a large coefficient but an enormous standard error. In this context, the effective tax rate seems to have a greater effect on corporate taxable income than the statutory rate on an additional dollar of income earned, but given the potential issues with expected changes in firm's tax status and tax law this result is only suggestive.

Table 4 shows this same specification as Table 2 estimated on different outcome variables. It is natural to ask whether the effect we observe on taxable income is due to a reduction in actual output or simply an ability on the part of the firm to engage in tax avoidance or tax sheltering. One preliminary way we investigate this question is to examine labor expenses and corporate capital expenditures as dependent variables.

There are several issues with this approach. First, data on labor expenses is only available for a subset of Compustat firms and is computed on an accounting basis. Second, even if labor were measured precisely, the effective tax rate essentially measures the tax on output from an additional unit of capital and higher tax rates could in theory induce substitution away from capital inputs and toward labor inputs. So even the theoretical direction of the coefficient on labor expense is ambiguous. Third, there are general equilibrium issues with interpreting these kind of production input specifications. The classic treatment of Harberger (1965) shows that if a capital tax is increased for a less capital-intensive sector relative to a more capital intensive sector, the aggregate quantity of capital demanded will actually increase.

The results on production inputs in Table 4 are generally inconclusive. The main coefficient in the labor expense equation is essentially zero. In the investment equation, the coefficient has the right sign but is statistically not significant. Taking a magnitude of 0.1 literally in the investment equation would imply an investment elasticity of 0.1 with respect to the effective tax rate, but the estimation is not precise enough to draw such a conclusion.

Table 4 also shows the results of examining a traditional definition of corporate profit, earnings before interest and tax (EBIT). Similar to Table 2, this measure is displays an elasticity of around 0.2 with respect to the effective tax rate. This specification shows that the main taxable income elasticity we measure is not an artifact of our procedure for deriving estimates of taxable income from corporate accounting data. Confirmation of the result from IRS industry-level administrative data, however, is an important step for future research.

V. Conclusions

Despite the growing literature on the elasticity of household taxable income with respect to parameters of the federal tax code, there have not been similar attempts to measure the elasticity of corporate taxable income. This is partly due to the fact that the corporate setting is more complex. Corporations face taxation at both the corporate and the personal level. They may be more rational or forward looking about future changes in the tax code than individuals. Furthermore, different marginal tax rates may be more relevant in defining the different margins of corporate behavior that affect corporate taxable income. Effective tax rates have been shown to matter for capital investment, whereas the marginal tax rate on an additional dollar of income impact the corporate financing decision which affects taxable income through interest deductions.

This paper considers a simplified version of the corporate tax setting and leaves a number of these complications for later work. At the industry level, we find a moderate elasticity of the corporate tax base with respect to current effective tax rates, on the order of –0.2. Our preliminary evidence suggests that corporate taxable income may be more responsive to effective marginal tax rates than to the marginal tax rate on an additional dollar earned. An important area for future research is to examine the robustness of these results to different assumptions about the importance of lagged and future expected tax policy, and to examine the elasticity of corporate taxable income to tax parameters over longer time horizons.

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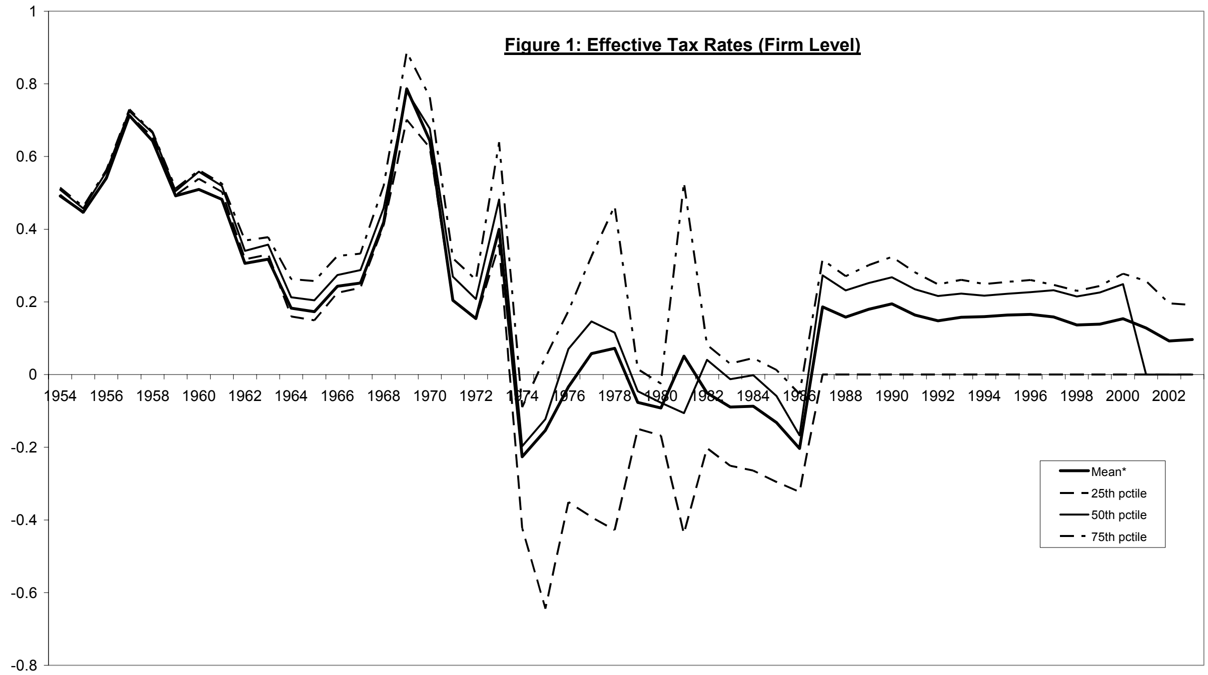
Figure 1: Effective Tax Rates (Firm Level)
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1954 1956 1958 1960 1962 1964 1966 1968 1970 1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002
Mean*
25th pctile
50th pctile
75th pctile

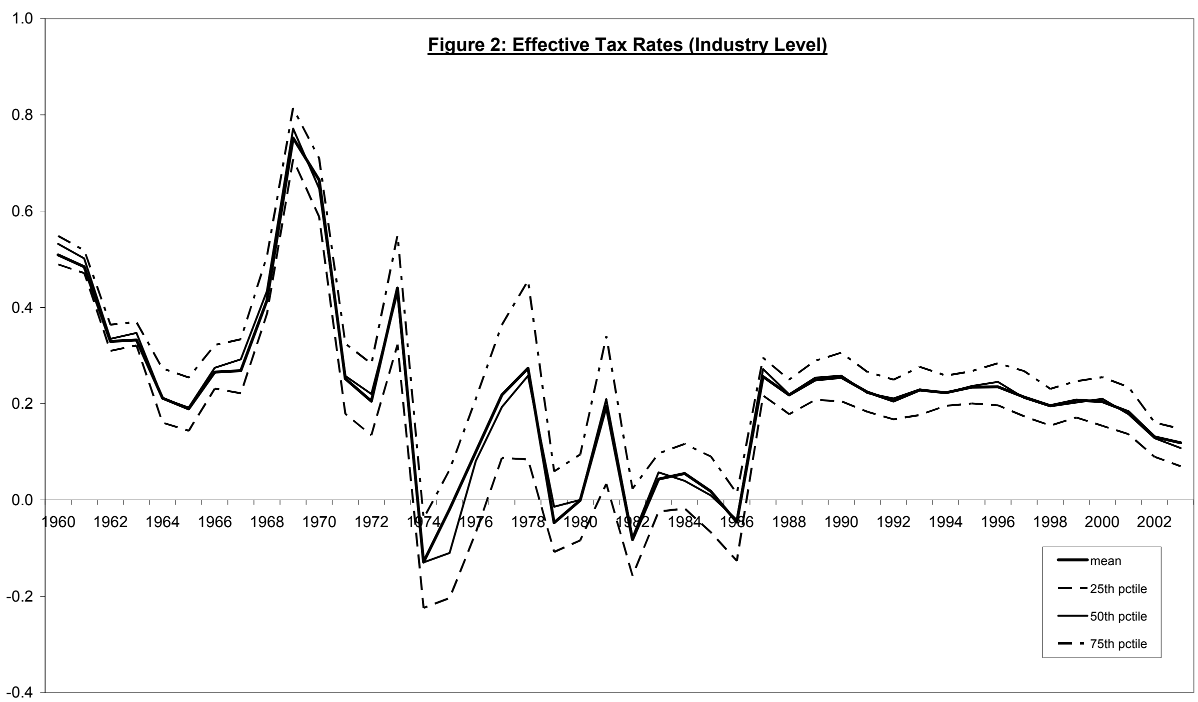
Figure 2: Effective Tax Rates (Industry Level)
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
1960 1962 1964 1966 1968 1970 1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002
mean
25th pctile
50th pctile
75th pctile

Table 1: Marginal Effective Tax Rates, Means by Industry

	1964-1968	1969-1973	1974-1978	1979-1983	1984-1988	1989-1993	1994-1998	1999-2003
Mining and Extraction	29.4%	38.7%	16.5%	-2.0%	4.3%	17.2%	20.1%	16.8%
Food and Tobacco	21.7%	47.0%	6.7%	1.6%	13.0%	26.3%	23.3%	18.3%
Manufacturing: Paper Products	29.3%	49.9%	5.2%	6.6%	12.8%	24.3%	27.6%	17.1%
Manufacturing: Chemicals, Plastics, Drugs	30.4%	49.7%	2.5%	-2.3%	14.5%	25.7%	24.4%	22.3%
Manufacturing: Stone and Metal	31.5%	50.3%	14.5%	10.1%	16.6%	26.2%	24.7%	19.7%
Manufacturing: General Industrial	31.9%	52.7%	14.1%	13.9%	14.5%	22.6%	25.4%	16.0%
Computer, Office, and Household Appliances	32.6%	46.0%	16.8%	-4.6%	10.2%	23.5%	20.0%	12.6%
Audio, Video, Communications, Electronics	34.5%	54.6%	18.7%	10.4%	14.5%	25.7%	23.4%	17.1%
Motor Vehicles and Aircraft	29.7%	56.1%	21.2%	8.4%	13.6%	24.6%	25.5%	20.6%
Scientific Instruments and Defense	25.8%	48.1%	11.2%	13.1%	15.3%	22.0%	23.6%	17.3%
Transportation	23.9%	42.2%	-1.7%	18.3%	29.2%	33.2%	23.4%	15.6%
Utilities	19.7%	42.4%	1.8%	0.0%	20.4%	22.9%	23.6%	19.9%
Wholesale and Retail Trade	18.0%	37.1%	10.4%	8.0%	23.4%	21.9%	25.4%	17.7%
Finance and Real Estate	24.5%	42.6%	11.3%	0.7%	11.2%	26.6%	21.0%	15.5%
Professional Services	28.1%	38.9%	20.3%	4.4%	3.7%	12.0%	25.9%	25.4%
Health and Educational Services	-4.9%	25.0%	16.1%	1.5%	-3.3%	17.6%	15.6%	7.2%

These industries represent the authors' consolidations of the actual 2-digit industries used in the empirical analysis.

Table 2: Effects of the Effective Tax Rate (ETR) on Taxable Income

Dependent Variable:	$\ln[(1\text{-}ETR_{t+1})/(1\text{-}ETR_t)]$	$\ln[(\text{Taxable Income}_{t+1})/(\text{Taxable Income}_t)]$	
$\ln[(1\text{-}ETR_{t+1})/(1\text{-}ETR_t)]$	0.944***	0.174**	0.197***
	(0.064)	(0.076)	(0.075)
Spline Control	None	None	Taxable Income
Description	1st Stage	IV	IV
Observations	2481	2481	2481
R-Squared	0.81	0.17	0.19

The first column is an OLS regression, and the second two columns are IV regressions. Each statistic is from a separate industry-level regression. All regressions contain year fixed effects. Standard errors are clustered by industry. *** significant at 1%, ** significant at 5%.

Table 3: Effects of the Effective Tax Rate (ETR) and Marginal Tax Rate (MTR) on Taxable Income

Dependent Variable:	$\ln[(1\text{-}ETR_{t+1})/(1\text{-}ETR_t)]$	$\ln[(1\text{-}MTR_{t+1})/(1\text{-}MTR_t)]$	$\ln[(\text{Taxable Income}_{t+1})/(\text{Taxable Income}_t)]$	
$\ln[(1\text{-}ETR_{t+1})/(1\text{-}ETR_t)]$	0.944***		0.172	0.216**
	(0.064)		(0.105)	(0.104)
$\ln[(1\text{-}MTR_{t+1})/(1\text{-}MTR_t)]$		0.928***	-0.113	1.122
		(0.204)	(2.836)	(2.625)
Spline Control	None	None	None	Taxable Income
Description	1st Stage	1st Stage	IV	IV
Observations	2481	2481	2481	2481
R-Squared	0.81	0.38	0.17	0.15

All regressions are at the industry level and contain year fixed effects. Standard errors are clustered by industry.
*** significant at 1%, ** significant at 5%.

Table 4: The Effective Tax Rate (ETR), Production Inputs, and Corporate Profits

Dependent Variable:	$\ln[(\text{Labor Expense}_{t+1})/(\text{Labor Expense}_t)]$	$\ln[(\text{Investment}_{t+1})/(\text{Investment}_t)]$	$\ln[(\text{EBIT}_{t+1})/(\text{EBIT}_t)]$
$\ln[(1\text{-ETR}_{t+1})/(1\text{-ETR}_t)]$	-0.015	0.101	0.213**
	(0.075)	(0.082)	(0.100)
Spline Control	None	None	None
	IV	IV	IV
Observations	1999	2704	2614
R-Squared	0.36	0.19	0.20
$\ln[(1\text{-ETR}_{t+1})/(1\text{-ETR}_t)]$	-0.009	0.115	0.219**
	(0.079)	(0.085)	(0.099)
Spline Control	Labor Expense	Investment	EBIT
	IV	IV	IV
Observations	1999	2704	2614
R-Squared	0.40	0.20	0.21

All columns are IV regressions. Each statistic is from a separate industry-level regression. All regressions contain year fixed effects. Standard errors are clustered by industry.
*** significant at 1%, ** significant at 5%.

Appendix Table: Corporate Tax Law Changes in the Model (1960-2003)

Year*	Brackets		Depreciation	Credits
1962				ITC Introduced
1964	First $25,000	22.00%		ITC Basis Adjustment Removed
	Over $25,000	50.00%		
1965	First $25,000	22.00%		
	Over $25,000	48.00%		
1968	First $25,000	24.20%		
	Over $25,000	52.80%		
1969			Change in Structure Lives	ITC Eliminated
1970	First $25,000	22.55%		
	Over $25,000	42.90%		
1971	First $25,000	22.00%	Change in Asset Lives	ITC Reinstated
	Over $25,000	48.00%		
1975	First $25,000	20.00%		ITC Revised
	$25,000 - $50,000	22.00%		
	Over $50,000	48.00%		
1979	First $25,000	17.00%		
	$25,000 - $50,000	20.00%		
	$50,000 - $75,000	30.00%		
	$75, 000 - $100,000	40.00%		
	Over $100,000	46.00%		
1981			ACRS	ITC Revised
1982	First $25,000	16.00%		
	$25,000 - $50,000	19.00%		
	$50,000 - $75,000	30.00%		
	$75, 000 - $100,000	40.00%		
	Over $100,000	46.00%		
1983	First $25,000	15.00%	TEFRA Modifications	ITC Basis Adjustment
	$25,000 - $50,000	18.00%		
	$50,000 - $75,000	30.00%		
	$75, 000 - $100,000	40.00%		
	Over $100,000	46.00%		
1984	First $25,000	15.00%		
	$25,000 - $50,000	18.00%		
	$50,000 - $75,000	30.00%		
	$75, 000 - $100,000	40.00%		
	$100,000 - $1,000,000	46.00%		
	$1,000,000 - $1,405,000	51.00%		
	Over $1,405,000	46.00%		
1987	First $25,000	15.00%	MACRS	ITC Ended
	$25,000 - $50,000	16.50%		
	$50,000 - $75,000	27.50%		
	$75, 000 - $100,000	37.00%		
	$100,000 - $335,000	42.50%		
	$335,000 - $1,000,000	40.00%		
	$1,000,000 - $1,405,000	42.50%		
	Over $1,405,000	40.00%		
1988	First $50,000	15.00%		
	$50,000 - $75,000	25.00%		
	$75, 000 - $100,000	34.00%		
	$100,000 - $335,000	39.00%		
	Over $335,000	34.00%		
1993	First $50,000	15.00%	Change in Structure Lives	
	$50,000 - $75,000	25.00%		
	$75, 000 - $100,000	34.00%		
	$100,000 - $335,000	39.00%		
	$335,000 - $10,000,000	34.00%		
	$10,000,000 - $15,000,00(	35.00%		
	$15,000,000 - $18,333,33:	38.00%		
	Over $18,333,333	35.00%		
2002			30% Bonus	
2003			50% Bonus	

* Year that law or bracket went into effect.