

The Extent of Implicit Taxes at the Corporate Level and the Effect of TRA86[†]

Ross Jennings*

*McCombs School of Business
University of Texas
1 University Station, B6400
Austin, TX 78712, USA*

Connie D. Weaver

*Mays Business School
Texas A&M University 4353 TAMU
College Station, TX 77843-4353, USA*

William J. Mayew

*Fuqua School of Business
Duke University
1 Towerview Drive
Durham, NC 27708, USA*

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* Corresponding author. Tel.: 512-471-5340; fax: 512-471-3904;
Email address: Ross.Jennings@mcombs.utexas.edu.

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ABSTRACT

We examine the extent of implicit taxes at the corporate level and the effect on implicit taxes of the Tax Reform Act of 1986 (TRA86) in the United States. Using a variety of specifications, we find consistent evidence that implicit taxes eliminate virtually all of the cross-sectional differences in explicit tax preferences prior to TRA86, and then abruptly decline and eliminate only about one-third of the cross-sectional differences in tax preferences in years following TRA86. We triangulate this evidence that implicit taxes declined following TRA86 by also providing evidence (a) of a decline in the relation between changes in tax preferences and changes in pre-tax returns, (b) of an increase in the persistence of tax-related earnings changes, (c) that these dramatic economic changes are priced by investors. Finally, we provide evidence suggesting that the decline in implicit taxes after TRA86 is driven at least in part by expansion of aggressive tax planning and use of tax shelters. Taken together these results indicate that TRA86 had a profound and lasting effect on implicit taxes at the corporate level.

JEL classification : M41, H25

Keywords : Implicit taxes, Corporate tax preferences, Cost advantage

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1 Introduction

In this study we investigate the extent of implicit taxes at the corporate level and the effect on implicit taxes of the Tax Reform Act of 1986 (TRA86). Implicit taxes are cross-sectional variations in pre-tax market returns that offset variations in the level of explicit taxes and equalize risk-adjusted after-tax rates of return. According to economic theory, in a competitive economy capital is attracted toward corporate activity that is explicitly taxed at lower rates, increasing input costs for those corporations and lowering their output prices. This process lowers the pre-tax return of corporations with lower explicit taxes and tends to equalize the risk-adjusted after-tax returns of corporations with different explicit tax rates.

Understanding the extent of implicit taxes at the corporate level is important for several reasons. First, from the perspective of tax policy, preferential tax provisions that lower explicit taxes are often intended to provide incentives to attract investment resources to certain economic activities, and the existence of implicit taxes indicate that the policies are working and that resources are shifting toward the tax-favored activities. Second, tax policy makers often face the criticism that tax preferences benefit only the shareholders of the companies receiving the preferences. The presence of implicit taxes indicates that it is not the shareholders of these firms that benefit from subsidies provided in the tax law, as is often claimed by critics of corporate tax preferences (McIntyre and Nguyen 2000, 2004). Third, investors are interested in whether low explicit tax rates are evidence of a persistent benefit to the company or that benefit is lost to other parties via implicit taxes. Finally, managers are interested in whether optimal tax planning provides a competitive advantage or is lost to implicit taxes that offset low explicit taxes.

Beyond investigating the level of implicit taxes faced by corporations, there are several *ex ante* reasons that motivate us to also investigate whether TRA86 changed the extent of implicit taxes faced by corporations. First, TRA86 was one of the most sweeping changes ever made to the tax code in the United

States, lowering the corporate rate from 46 percent to 34 percent and eliminating many corporate tax preferences. Among other provisions, TRA86 eliminated the investment tax credit, changed the tax treatment for depreciation, mergers and acquisitions, and foreign-source income, and also modified a number of industry-specific tax provisions for natural resources, finance, and insurance (Auerbach and Slemrod 1997). Shevlin and Porter (1992) summarize the potential impact of TRA86 on implicit taxes as follows: “Given the changes introduced by TRA86, the distribution of implicit taxes across firms is likely to have changed, making policy statements about tax burdens based only on explicit taxes problematic” (page 78).

Second, enactment of TRA86 was in large part a response to a perception of “unfairness” in the tax system that permitted wide variation in explicit corporate tax burdens (Auerbach and Slemrod 1997). However, Gupta and Newberry (1997) present evidence (table 2) that in spite of the political rhetoric surrounding its enactment TRA86 did not result in less variation of effective tax rates across firms, suggesting that TRA86 changed one set of preferences for another.

Third, although their research objective did not involve implicit taxes, Gupta and Newberry (1997) provide evidence (table 5) that suggests that TRA86 changed the extent of implicit taxes at the corporate level. Specifically, they report that the association between effective tax rates and pre-tax income was strongly positive prior to 1986, consistent with implicit taxes, but this association declined sharply following 1986, suggesting weaker implicit taxes. In this study we investigate this possibility.

Prior research that directly examines the extent of implicit taxes at the corporate level is very limited. Wilkie (1992) investigates a period prior to TRA86 and finds evidence of implicit taxes at the corporate level, but the relation is weaker than predicted in a perfectly competitive market. Callihan and White (1999) and Salvador and Vendrzyk (2006) analyze data surrounding the enactment of TRA86, but both studies examine the role of market power on implicit taxes and do not provide direct evidence on the effect of TRA86.

For implicit taxes at the corporate level to adjust to the dramatic changes in explicit taxes resulting from TRA86, firms affected by the Act would need to shift resources away from activities on which the Act had increased explicit taxes and toward activities on which the Act had decreased explicit

taxes. A number of studies that are discussed further below provide evidence that indeed firms reacted rapidly and in various ways to the enactment of TRA86 (e.g. Scholes and Wolfson 1990; Collins and Shackelford 1992; Givoly et al. 1992; Scholes, Wilson, and Wolfson 1992; Harris 1993; Klassen, Lang, and Wolfson 1993; Guenther 1994a; and Maydew 1997). Although these studies suggest the potential for changes in firm behavior that might affect implicit taxes at the corporate level following TRA86, none of these studies examines that issue directly.

In addition, a number of empirical studies in economics provide evidence of relatively rapid changes in tax incidence in response to economy-wide changes in explicit taxes. These studies provide evidence of firms losing the benefit of an explicit tax decrease to suppliers (Goolsby 1997) or employees (Aus dem Moore and Kasten 2009), or shifting explicit tax increases back to employees (Arulampalam, Devereux, and Maffini 2008) or forward to customers (Sebold 1979; Ablett and Hart 2006). However, while these shifts are consistent with the process underlying implicit taxes, all of this evidence is based on data at the economy or industry level and does not specifically address implicit taxes at the corporate level or within a national economy.

Our results are based on a large sample of firm-year observations for the period 1976 to 2005. Using four alternative specifications, we provide strong evidence that prior to TRA86 implicit taxes at the corporate level offset virtually all of the variation in explicit taxes. Immediately following TRA86 we observe a large and sudden decline in the extent of implicit taxes. One of our specifications estimates the extent of implicit taxes and finds that an average of 97.5 percent of the variation in explicit taxes is offset by variation in pre-tax income prior to TRA86, but that after enactment of TRA86 only 29.6 percent of the variation in explicit taxes is offset by variation in pre-tax income. We also find that this decline occurs abruptly during the transition to TRA86 and the lower rate is maintained indefinitely thereafter. Specifically, our estimate for implicit taxes falls from 90.4 percent in 1985 to 33.8 percent in 1988, averages 37.1 percent over the next five years (1988-92) and averages 33.6 percent over the last five years of our study period (2001-05).

We also find corroborating empirical evidence of this decline in implicit taxes that allows us to triangulate our results. First, we find that immediately after TRA86 the negative relation between *changes*

in pre-tax profits and *changes* in explicit taxes is weaker, which is consistent with the levels tests reported in our main results. Second, we find that after TRA86 the persistence of tax-related earnings changes is greater, which indicates that implicit taxes are slower to erode after-tax benefits of new tax preferences. Finally, we find that after TRA86, the relative market value of firms with low explicit taxes (high preferences) is greater, compared to before TRA86, which suggests that investors are aware of the differential ability of shareholders to retain explicit tax preferences after TRA86 relative to before TRA86.

Finally, we provide preliminary evidence on the underlying cause of the decline in implicit taxes at the corporate level following TRA86. We find no evidence that this decline is due to changes in competitive pressure in the economy. Rather, we find evidence that the decline in implicit taxes is associated with indicators from prior research of an expansion in aggressive tax planning and use of tax shelters following TRA86.

In the next section we review the Tax Reform Act of 1986 and research on implicit taxes and tax incidence at the corporate level. Section three presents the data and measurement of the main variables. The main results and corroborating empirical evidence are presented in sections four and five. Sections six and seven present evidence on the cause of the decline in implicit taxes and concluding remarks.

2 Theory and prior research

This study draws upon several distinct but related streams of literature: limited studies of the existence of implicit taxes at the corporate level, a long line of research in economics on the incidence of the corporate income tax, and research in accounting on reactions by companies to TRA86.

Prior research on implicit taxes at the corporate level

The main prior study on the extent of implicit taxes at the corporate level is Wilkie (1992), who uses financial statement data to examine a period that precedes TRA86. He measures tax subsidies as the difference between what explicit taxes would be if firms' income were taxed at the top statutory federal tax rate and actual taxes paid, and finds an inverse relation between his measure of tax subsidies and pre-tax returns consistent with implicit tax theory. However the relation is weaker than predicted if the entire

differential tax burden is shifted forward onto customers or backward onto suppliers and labor. This result led Wilkie (1992) to conclude that either market frictions exist that impede implicit taxes (e.g., limits to the ability of capital to migrate away from the higher tax sector) or that measurement error prevents him from accurately estimating the extent of implicit taxes.

Two additional accounting studies examine the effect of market power on implicit taxes. Callihan and White (1999) develop a measure of implicit taxes based upon the difference between an estimate of pre-tax returns on a fully taxable investment and firms' actual pre-tax returns, however as Wright (2001) demonstrates, this is actually a measure of tax preferences and therefore does not measure the extent of implicit taxes. Salvador and Vandrzyk (2006) also evaluate the effects of market power on implicit taxes by investigating the relation between pre-tax income and tax preferences in the defense contractor industry. They examine changes around TRA86, but they implicitly assume that implicit taxes are the same in the periods before and after TRA86.

This research provides some evidence of implicit taxes at the corporate level prior to TRA86, but no evidence on implicit taxes after TRA86.¹ In spite of the lack of research after TRA86, implicit taxes at the corporate level continues to be an important public policy issue. In his recent State of the Union address, President Obama repeated the rhetoric that led to enactment of TRA86 by criticizing variation in explicit corporate tax rates without recognizing the potential role for implicit taxes in reversing that variation.

. . . over the years, a parade of lobbyists has rigged the tax code to benefit particular companies and industries. Those with accountants or lawyers to work the system can end up paying no taxes at all. But all the rest are hit with one of the highest corporate tax rates in the world. It makes no sense, and it has to change. (State of the Union Address, January 25, 2011)

¹ Another stream of research investigates the presence of implicit taxes for investments in specific assets. These studies generally find that investors in particular tax-favored assets do not fully retain the tax savings, but rather share some portion of the explicit tax savings with other parties as an implicit tax. Specific assets examined for implicit taxes include tax-deductible goodwill (Ayers, Lefanowicz, and Robinson 2000), research and development expenditures (Berger 1993), U.S. treasury bills (Guenther 1994b), state and local government bonds (Atwood 2003), preferred stocks (Erickson and Maydew 1998; Dunbar and Veliotis 2005), income trusts (Klassen and Mescall 2006), and leveraged employee stock ownership (ESOP) plans (Shackelford 1991). More recently, Edgerton (2011) presents evidence that is consistent with the presence of implicit taxes for used equipment. Specifically, he reports that prices for used farm equipment, and to a lesser extent used aircraft, were held down when investment tax credits were available relative to prices in these markets when investment tax credits were not available.

Incidence of the corporate income tax – theory and empirical evidence

The issue of implicit taxes at the corporate level is a special case of the incidence of corporate income taxes. Theoretical research in economics analyzes corporate tax incidence as dependent on the relative mobility of capital, labor, and goods and services within and between national economies. For example, if capital is relatively mobile and foreign and domestic goods are relatively interchangeable, then as a result of the natural immobility of labor and services, the incidence of the corporate income tax will fall more heavily on labor (described in Harberger 2008). Alternatively, Gravelle and Smetters (2006) consider the case where domestic and foreign products are not perfect substitutes for each other, so that, depending on the mobility of capital, the corporate income tax will be borne by capital in the domestic market or shared with capital in the foreign market (see Harberger 2008 and Gravelle 2008 for further discussion). Although this theoretical research identifies the key economic factors that determine the incidence of corporate income taxes, it does not determine who bears this tax.

Most of the empirical research in economics that attempts to directly assess the incidence of the corporate income tax examines the time-series correlation of changes in the statutory corporate tax rate for a specific economy and pre-tax profits for companies or industries operating in that economy. This research was most active in the late 1960s and early 1970s, but did not reach a clear conclusion.² As Ablett and Hart (2006) state, “. . . despite this work, unambiguous incidence conclusions remain elusive” (page 47).

The issue of implicit taxes at the corporate level differs somewhat from the issue of the incidence of the corporate income tax. Rather than examine which prices are most affected by changes over time in the economy-wide statutory corporate income tax rate, studies of implicit taxes focus on cross-sectional variation in the actual corporate tax burden across firms in the same economy. Thus, the focus of implicit taxes is the within-economy variation in tax burdens at a point in time, variation that is ignored by studies

² One of the first studies was Krzyzaniak and Musgrave (1963), which reported results that indicated the corporate sector was able to avoid much of the change in corporate taxes over time. This study gave rise to additional research that criticized and attempted to explain or repair the empirical methods in the original study, but that did not lead to a consensus on the issue (see Cragg, Harberger, and Mieszkowski 1967; Gordon 1967; Krzyzaniak and Musgrave 1968; Gordon 1968; Krzyzaniak and Musgrave 1970; Cragg, Harberger, and Mieszkowski 1970; Sebold 1970; and Gordon 1970). A later study by Sebold (1979), using a more sophisticated empirical model, reports that corporations shift about 69 percent of the change in corporate income taxes to consumers in the form of higher prices.

of the incidence of the corporate income tax. However, applying the intuition from economic models on the incidence of corporate income taxes to the issue of implicit taxes at the corporate level suggests that the extent of implicit taxes will also depend on the mobility of labor, capital, and goods and services between high and low tax sectors in the national economy and across national boundaries.

Empirical studies in economics provide evidence of intertemporal changes in economy-wide corporate tax incidence that are consistent with implicit taxes. For example, Goolsby (1997) uses data from 1959 to 1988 and reports that increases in the investment tax credit are associated with a substantial immediate increase in the prices of equipment, suggesting that a large portion of this reduction in explicit taxes is shifted backward to their suppliers. Another study reports strong evidence in Great Britain (and weaker evidence in France) that a significant increase in wages was associated with the *reduction* in the corporate income tax rate implemented by the German Business Tax Reform of 2000 (aus dem Moore and Kasten 2009). In the opposite direction, Arulampalam et al. (2008) examine taxes and wage rates across nine European countries from 1996 to 2003 and report that a one-dollar increase in explicit corporate taxes is associated with a 92-cent reduction in wages over the long run. Finally, Ablett and Hart (2006) examine Australian data for 1989 to 1999 and find that changes in the corporate income tax are substantially shifted forward onto consumers.

Although these studies do not explicitly address implicit taxes, they document that economy-wide changes in explicit taxes are borne to varying extent by suppliers, employees, and customers of the corporation rather than its shareholders. Thus, these studies suggest that changes in implicit taxes offset some or much of the economy-wide changes in explicit taxes. However, all of the evidence to date has been at the industry or economy level, not the corporate level. This distinction is important because the tax changes studied were statutory rate changes imposed across national economies and not changes in relative effective tax rates within an economy. Moreover, this evidence is all either from outside the United States or from inside the United States but before TRA86, and thus cannot be used to address the effect of TRA86 on implicit taxes at the corporate level.

Implicit taxes and the Tax Reform Act of 1986

The Tax Reform Act of 1986 (TRA86) is one of the most dramatic overhauls of the U.S. tax code, and thus is a natural place to look for changes in implicit taxes at the corporate level. However, the changes to the tax code for both individuals and corporations were so pervasive that it is difficult to isolate the marginal effects of any one element of the Act. In their survey of a decade of empirical research on the effects of TRA86, Auerbach and Slemrod (1997) conclude that the most important effects of the Act were related to the timing of economic transactions immediately before and after the Act in response to changes in the relevant marginal tax rate. Examples of such behavioral responses to TRA86 involve merger and acquisition decisions (Scholes and Wolfson 1990), financing decisions (Collins and Shackelford 1992; Givoly et al. 1992), and income shifting between periods or across taxing jurisdictions during the period surrounding transition to the TRA86 (Scholes et al. 1992; Harris 1993; Klassen et al. 1993; Guenther 1994a; Maydew 1997). These results suggest that TRA86 substantially disrupted the sources of variation in explicit corporate tax burdens.

Prior to the Act, as a result of both variation across companies in their exposure to state and foreign taxes and variation in their ability to take advantage of preferential provisions of the U.S. tax code, profitable U.S. corporations reported a wide range of effective tax rates (Rego 2003; Gupta and Newberry 1997). One of the objectives of TRA86 was to eliminate the “unfairness” that many attributed to a tax code that permitted such variation in tax rates. Accordingly, the Act lowered the statutory corporate rate from 46 percent to 34 percent, eliminated the investment tax credit, lengthened tax depreciation schedules, introduced a corporate alternative minimum tax, reduced tax benefits from mergers and acquisitions, and changed the tax treatment for foreign-source income and tax provisions for natural resource, finance, and insurance industries (Auerbach and Slemrod 1997).³ Partially consistent with Congress’s intent, Shevlin and Porter (1992) document that effective tax rates for a sample of firms with historically low effective tax rates generally increased after TRA86 due to the broadening of the tax base in spite of the decline in statutory tax rates.

³ TRA86 also changed individual ordinary and capital gains tax rates; however, because we focus on corporate-level rather than investor-level implicit taxes, changes to individual tax rates are not relevant to our study.

Gupta and Newberry (1997) provide similar evidence for a broader sample of firms. They report a slight increase in effective tax rate from 1985 to 1987, suggesting that the rate-increasing effect of broadening the base more than offset the reduction in the statutory rate. Gupta and Newberry (1997) also provide descriptive evidence that the cross-sectional standard deviation of effective tax rates was nearly identical before and after 1986. Specifically, in their table 2, Gupta and Newberry (1997) report that the cross-sectional standard deviation of the ratio of current tax expense to pre-tax income increased slightly from 18.51 in the four years before TRA86 to 18.90 for the four years following TRA86. Finally, although it was not interpreted as such, Gupta and Newberry (1997) provide some evidence that implicit taxes declined sharply after TRA86. In their main analysis reported in table 5, Gupta and Newberry (1997) examine the determinants of corporate effective tax rates during a nine-year period surrounding 1986. They report a significant *reduction* in the coefficient estimate for pre-tax income from the four years before TRA86 (0.733) to the four years following TRA86 (0.125), suggesting a dramatic decrease in the relation between tax preferences and pre-tax income that is consistent with a decline in implicit taxes.⁴

We provide evidence on two main questions. The first is the extent of implicit taxes at the corporate level before TRA86, a period of substantial variation in explicit taxes. Second, we provide evidence on whether the extent of implicit taxes declined after enactment of TRA86, the intent of which was to reduce or eliminate many sources of corporate tax preferences.

3 Data and variables

Sample selection

We begin our sample selection by identifying 145,832 U.S. domiciled, non-regulated and non-financial firm-year observations from 1976-2005 that have total assets and non-negative shareholders' equity for the current year in the Compustat database. We eliminate observations with (a) opening book value of common equity less than \$1 million (22,350 observations), (b) pre-tax book income (adjusted for

⁴ Gupta and Newberry (1997) include pre-tax returns in their regression to “control for profitability” (page 15) and interpret the reduction in the coefficient estimate on this variable following TRA86 as “consistent with the expected impact of the tax reductions introduced by TRA86” (page 27).

special items) less than \$500,000 (42,798 observations), (c) non-positive tax expense (4,435 observations), and (d) return on equity greater than 100 percent (1,249 observations). We impose the first and third requirements to reduce the likelihood that firms in the sample have low effective tax rates because of net operating loss carry forwards rather than from tax preferences for profitable firms. We impose the second requirement to avoid attributing low effective tax rates to firms with losses or low profits rather than to tax preferences for profitable firms. The last requirement excludes observations with extreme *ROE* values. Our final sample includes 75,000 firm-year observations (9,881 unique firms) distributed across 57 two-digit SIC codes. We divide the study period into two sub-periods to be analyzed separately, 1976-85 and 1988-2005. The first period is before and the second period is after Congress enacted the Tax Reform Act of 1986 (TRA86). We consider 1986 and 1987 to be transition years (4,693 firm-year observations).

Main variables

For our main analysis our measure of tax burden follows Chen, Chen, Chiang, and Shevlin (2010) and others who measure tax expense (*TAX*\$) on the basis of generally accepted accounting principles.⁵ We then define each firm's worldwide effective tax rate (*etr*) as the ratio of total tax expense (*TAX*\$) to pre-tax income (*PTI*)

$$etr = \frac{TAX\$}{PTI} \tag{1}$$

We remove the effects of special items in our measurement of both *PTI* (add losses and subtract gains) and *TAX*\$ (add losses and subtract gains times *etr*) in order to base our analysis on profit and tax expense numbers that are more representative of the continuing performance of the company.⁶ This adjustment is important as the incidence of special items in U.S. income statements was relatively low during the early years of our sample period and grew dramatically during the 1980s (Elliott and Hanna 1996; Collins, Maydew and Weiss 1997; Donelson, Jennings and McInnis 2011).

⁵ This measure focuses on tax preferences that arise from permanent differences between reported income and taxable income, ignoring the benefit of deferral that arises from temporary differences between reported income and taxable income. We address the benefit of deferral in robustness checks below.

⁶ This adjustment for special items affects our measure of *PTI*, *TAX*\$, and *ROE*, but not our measure of *etr*.

We compute after-tax return on equity (*ROE*) as the ratio of pre-tax income (*PTI*) less tax expense to beginning-of-period owners' equity (*OE*)

$$ROE = \frac{PTI - TAX\$}{OE} \quad (2)$$

Finally, we measure tax expense (pre-tax income) on a rate of return basis as *TAX* (*PTR*), which is equal to *TAX* (*PTI*) divided by *OE*.⁷

Descriptive statistics

Table 1 provides descriptive statistics for pre-tax returns (*PTR*), return on equity (*ROE*), and effective tax rate (*etr*). We observe that mean *PTR* declines from 32.6 percent before TRA86 to 28.4 percent after TRA86. In contrast, average *ROE* exhibits relatively little change between the two periods. Consistent with Congressional action during this time period, average *etr* declines from 41.8 percent before TRA86 to 35.7 percent after TRA86.⁸

Although the average effective tax rate declines throughout our study period, the cross-sectional variation in effective tax rates does not decline. The average annual standard deviation for *etr* increases from 0.102 before TRA86 (1976-85) to 0.138 after TRA86 (1988-2005). This indicates increasing variation in firms' explicit taxes that could potentially be offset by implicit taxes.

-----INSERT TABLE 1 ABOUT HERE-----

4 Implicit taxes at the corporate level before and after TRA86

In this section we report the results for alternative analyses that estimate the existence and extent of implicit taxes at the corporate level before and after enactment of TRA86. Detecting implicit taxes at the corporate level requires measures of before-tax economic performance, after-tax economic performance and the difference, the tax burden borne by the company. Each of these measures, especially the measure of tax burden, has the potential for measurement error that might affect our results. For example, differences in the consolidation rules for financial and tax reporting may hinder our ability to

⁷ We winsorize the effective tax rate to an upper (lower) bound of one (zero) to allow for meaningful interpretations of *etr*. *PTR* and *ROE* are winsorized annually at the 1 percent and 99 percent levels to reduce the impact of outliers.

⁸ The maximum statutory federal income tax rate (not tabulated) fell from a median of 46 percent before TRA86 to a median of 35 percent after TR86.

properly measure tax burdens (Mills, Newberry, and Trautman 2002; Hanlon 2003; McGill and Outslay 2004). In addition, Hanlon and Shevlin (2002) provide evidence that the method of accounting for employee stock options used during our sample period overstates our measure of firms' effective tax rates. Another potential source of measurement error arises when managers record a tax reserve related to an aggressive position on the company's tax return (Gleason and Mills 2002). Because of the potential limitations of these measures we present four alternative specifications to test our research question. While the four alternative specifications should not be viewed as independent analyses, they rely on overlapping data in different ways. The consistency of the results enhances confidence in the reliability of the results.

Comparison of high and low tax preference groups

In our first analysis, we use our measure of effective tax rate (*etr*) to divide the sample each year into a "high tax" group (*etr* in the top 40 percent of the annual distribution) and a "low tax" group (*etr* in the bottom 40 percent of the annual distribution). Table 2 reports average *PTR* and *TAX* prior to TRA86 (1976-85) and after TRA86 (1988-2005). The first two rows report averages for *PTR* and *TAX* for the high tax group, the next two rows report analogous results for the low tax group, and the final three rows report the difference between the high and low tax groups and the ratio for these two measures.

Focusing on the differences and ratio reported in the last three rows for the pre-TRA86 period, the low tax group has an explicit tax advantage of 0.101 by construction. According to implicit tax theory, this advantage should be offset by a *PTR* disadvantage, which we observe: *PTR* is lower for the low tax group by 0.114. The ratio of the *PTR* difference to the explicit tax advantage for the low tax group is 1.129, which indicates that the explicit tax advantage enjoyed by the low tax group is more than offset by the *PTR* disadvantage for this group. This suggests that implicit taxes completely offset differences in explicit taxes between these two groups.

For the post-TRA86 period the results are quite different. First, the explicit tax advantage of the low tax group has slightly narrowed to 0.088, as would be expected because TRA86 was designed to reduce tax preferences. Second, the *PTR* disadvantage of the low tax group is narrowed even further,

from 0.114 in the pre-TRA86 period to 0.024 in the post-TRA86 period. The ratio of the *PTR* difference to the *TAX* difference is 0.273, suggesting that in the post-TRA86 period less than a third of the explicit tax advantage of 0.088 is offset by the *PTR* disadvantage of 0.024. This suggests a dramatic reduction in implicit taxes.⁹

-----INSERT TABLE 2 ABOUT HERE-----

Mechanically, this decline in implicit taxes arises because, given the difference in explicit taxes between these two groups, the difference in *PTR* is too small. However, this could arise because the *PTR* of the high tax group is too low or because the *PTR* of the low tax group is too high. The evidence in table 2 suggests that both may be the case. First, for the high tax group the *PTR* difference from the pre-TRA86 period to the post-TRA-86 period is more than the difference in explicit taxes, indicating that their *PTR*s decreased by more than what one would expect given the change in explicit taxes. In addition, for the low tax group the *PTR* difference from the pre-TRA86 period to the post-TRA86 period is less than the difference in explicit taxes. In this case even though explicit taxes are lower by about a quarter (0.069 rather than 0.090), *PTR* is essentially unchanged between the pre- and post-TRA86 period.

In figure 1 we present the year-by-year results for the high/low differences in *PTR*, *TAX*, and their ratio underlying the pre-TRA86 and post-TRA86 averages reported in the final three rows of table 2. Overall, the shift in the graphs from before 1986 to after 1986 is quite dramatic. For the ten years prior to TRA86, *PTR* is substantially higher for the high-tax group as indicated by the positive values for the *PTR* difference, but this difference dramatically declines around 1986-87 and the difference is close to zero thereafter. The *TAX* difference before 1986 is also positive (by construction) and decreases slightly after 1986 and becomes somewhat more volatile. The line representing the ratio of the differences in *PTR* to *TAX* shows the dramatic decline around 1986. Taken together, these patterns suggest that implicit taxes completely offset any explicit tax advantage prior to 1986 and that the offset was less consistent and less

⁹ Shevlin and Porter ((1992) find *etr* for firms with low *etrs* generally increased after TRA86, compared to our small decrease for firms with low *etrs*. However, Shevlin and Porter (1992) use a unique sample of firms that were held up for public scrutiny for their low *etrs* before TRA86 was enacted in contrast to the broad sample used in this study.

complete after 1986. Further, we note that the change occurred abruptly during the 1986-87 period.¹⁰

-----INSERT FIGURE 1 ABOUT HERE-----

Correlation analysis

In this subsection we compute the correlation each year between effective tax rate (*etr*) and both pre-tax return (*PTR*) and after-tax return on equity (*ROE*). If implicit taxes offset the tax benefits of firms with low tax burden (*etr*), we should observe positive correlation between *etr* and *PTR* and no (weaker) correlation between *etr* and *ROE* because firms are expected to have the same return on equity (for the moment ignoring risk and assuming that all else is equal). On the other hand, to the extent that implicit taxes do not offset the tax benefit of firms with low tax burden, we should observe weaker correlation between *etr* and *PTR* and a negative correlation between *etr* and *ROE*, as firms with lower effective tax rates are permitted by the market to retain some of those tax benefits in their after-tax returns.

We report results for each year in our study period in table 3. For the period before TRA86 the average correlation between *etr* and *PTR* is 0.215, and the annual correlation is significant at the five percent level in all ten years. Also, during the pre-TRA86 period the correlation between *etr* and *ROE* is 0.041, and only one of these annual correlations (1979) is significant at the five percent level or better. Both of these results are consistent with implicit taxes at the corporate level that offset variation in explicit tax preferences prior to TRA86. After TRA86 the average correlation between *etr* and *PTR* is much weaker (-0.011) and only one of the 18 annual correlations (1994) is significantly positive at the five percent level. Also, during the post-TRA86 period, the average correlation between *etr* and *ROE* is -0.218 and all 18 annual correlations are significantly negative at the five percent level. These results suggest that after TRA86 firms with lower effective tax rates had higher after tax returns, indicating that

¹⁰ Table 2 and figure 1 present evidence on the relation among *PTR* and *TAX* before and after TRA86, not the change for individual firms surrounding TRA86. Thus, these results do not imply that firms with a high tax burden continued to have a high tax burden and experienced a decline in their *PTR* after TRA86, but rather suggest a weaker negative association between *PTR* and *TAX* after TRA86 than before TRA86. In addition, it is not possible to conclude from table 2 that implicit taxes are lower after TRA86 because firms in the high tax group have *PTR* that is too low, or because firms in the low tax group have *PTR* that is too high, only that the *PTR* difference between the two groups is too small to eliminate the larger tax difference between the two groups.

implicit taxes did not eliminate all of the firms' tax benefits.¹¹

-----INSERT TABLE 3 ABOUT HERE-----

Regression analysis of effective tax rates on economic determinants

In this subsection we extend the previous analysis by examining the relation between explicit taxes and pre-tax returns while controlling for other determinants of effective tax rates. We follow Gupta and Newberry (1997) and estimate the following cross-sectional regression each year

$$\begin{aligned}
 etr = \text{Pr } e & [\gamma_0 + \gamma_1 \textit{Size} + \gamma_2 \textit{Lev} + \gamma_3 \textit{CAP} + \gamma_4 \textit{INV} + \gamma_5 \textit{RD} + \gamma_6 \textit{PTR} + \gamma_7 \textit{FOR}] \\
 & + \textit{Post} [\gamma_8 + \gamma_9 \textit{Size} + \gamma_{10} \textit{Lev} + \gamma_{11} \textit{CAP} + \gamma_{12} \textit{INV} + \gamma_{13} \textit{RD} \\
 & + \gamma_{14} \textit{PTR} + \gamma_{15} \textit{FOR}] + \varepsilon
 \end{aligned} \tag{3}$$

The first six independent variables (*Size*, *Lev*, *CAP*, *INV*, *RD*, and *PTR*) are the main variables included by Gupta and Newberry (1997), firm size, leverage, capital intensity, inventory intensity, research and development intensity, and pre-tax return, respectively, all computed at the beginning of the current period. *Size* is the natural logarithm of total assets. *Lev* is the ratio of long-term debt to total assets. *CAP* is the ratio of net property, plant, and equipment to total assets. *INV* is the ratio of inventory to total assets. *RD* is the ratio of R&D expense for the current year to sales for the current year. If R&D expense is missing, we set *RD* equal to zero. *PTR* is as defined in our previous analyses. We add *FOR* as an additional explanatory variable, which is the ratio of foreign sales to total sales, both in the current year (Rego 2003). *Pre* (*Post*) is a dummy variable that takes the value of one for years from 1976-1985 (1988-2005) and zero otherwise. We cluster the standard errors by firm to correct for correlation in the independent variables and in the residuals over time.

Descriptive statistics for our regression variables are reported in panel A of table 4, and results of our estimation of regression (3) are reported in panel B. For the pre-TRA86 period (1976-85) the regression coefficient estimates for five of the seven independent variables are highly significant. The incremental coefficient estimates (represented by the column labeled Difference) in the post-TRA86

¹¹ The results reported in table 3 are Pearson correlations. We also computed Spearman correlations and the results are essentially the same.

period (1988-2005) are also significant for five of the seven independent variables. The coefficients for *Size*, capital intensity, inventory intensity, and *PTR* are significantly smaller after TRA86 than before, and the coefficient estimate for R&D is significantly larger after TRA86 than before.¹²

Our primary interest is in the coefficient estimate for *PTR*, which exhibits a dramatic change from before TRA86 to after, declining from 0.102 to -0.004.¹³ The significant positive relation between pre-tax returns and effective tax rate that we observe pre-TRA86 indicates strong implicit taxes at the corporate level during this period. Post-TRA86 this coefficient declines sharply and is no longer significant. This reduction is consistent with a sharp decline in implicit taxes at the corporate level following TRA86.¹⁴

-----INSERT TABLE 4 ABOUT HERE-----

Estimating the extent of implicit taxes

Our objective for the analysis in this subsection is not only to provide additional evidence on *whether* there was a change in implicit taxes at the corporate level surrounding TRA86, but also to measure the *extent* of implicit taxes both before and after TRA86. The main prior research on the extent of implicit taxes is Wilkie (1992), who regresses pre-tax returns on an estimate of the firm's tax preferences (called "tax subsidy"), where a coefficient estimate between zero and negative one provides evidence of the extent of implicit taxes. As we explain in the appendix, we evaluated Wilkie's method and found two primary weaknesses that led us to develop an alternative method that is not subject to these weaknesses. First, Wilkie's (1992) method is very sensitive to the sample used in the analysis. While we are able to generally replicate Wilkie's results for a similarly restricted sample of survivor firms, we

¹² Compared with results for *ETR1* reported by Gupta and Newberry (1997) in their table 5 for the difference between the pre-TRA86 and the post-TRA86 periods, our results differ for *Lev*, where they report a significant decrease, and *CAP*, where they report a significant increase. Primary differences between our analysis and theirs are that (a) we have 29 years of data and about 2,500 observations per year compared to their eight years and 655 observations per year, (b) we use total tax expense in our calculation of *etr* rather than current tax expense, and (c) we include an additional control variable (*FOR*) as suggested in subsequent literature.

¹³ Inclusion of industry fixed effects in equation (3) did not change the results.

¹⁴ These results are quite parallel to those presented in table 2. The decline in the coefficient estimate for *PTR* following TRA86 indicates that the extent to which *PTR* offsets variation in explicit taxes declined after TRA86 just as we saw using averages for high and low explicit tax groups in table 2. However, as with table 2, this analysis cannot reveal whether the *PTR* coefficient estimate decline is driven by the high or low explicit tax firms. The results in table 4 only tell us that the co-variation between *etr* and *PTR* has declined, indicating a decline in implicit taxes.

obtain different results for his time period for our much broader sample (see appendix for details). Second, Wilkie calculates the tax subsidy using pretax income measured *after* the effects of implicit taxes, which overstates the tax subsidy if any implicit taxes exist and results in a downward bias in the coefficient of implicit taxes. Wilkie acknowledges that systematic measurement errors may contribute to the weaker than expected estimates of implicit taxes (p. 112).

In contrast to Wilkie (1992), our research design results in a nonlinear relation between a measure of explicit tax preferences, a parameter that captures the extent of implicit taxes, and a measure of after-tax returns. Our analysis also controls for variation across industries in risk and accounting measurement errors that may be associated with tax preferences.

We begin by specifying t^* as the equilibrium corporate tax rate in the economy. This is the rate that all firms would pay if they were to pay the same rate, i.e. if there were no tax preferences and therefore no implicit taxes. Under these conditions, companies will retain $(1 - t^*)$ of their equilibrium pre-tax return ($PTR^* = \text{equilibrium pre-tax income}/\text{owners' equity}$). Next, we allow actual effective tax rates (etr) to deviate from the equilibrium tax rate (t^*) by introducing lambda (λ), the percentage change in pre-tax income retained by the company, such that

$$(1 + \lambda)(1 - t^*) = (1 - etr) \quad (4)$$

Solving (4) for λ we have

$$\lambda = \left[\frac{1 - etr}{1 - t^*} \right] - 1 = \frac{t^* - etr}{1 - t^*} \quad (5)$$

When λ is positive, the company has a tax “preference” and $etr < t^*$. In contrast when λ is negative, the company has an additional tax “burden” and $etr > t^*$. As a numerical example, assume that $t^* = 0.40$ and $etr = 0.34$, so that $\lambda = 10$ percent, which is the percentage increase in the after-tax return on a pre-tax dollar of income resulting from the tax preference. In this example, the firm’s etr falls from 40 percent to 34 percent and after-tax income from a dollar of pre-tax income for that firm rises from 60 cents to 66 cents, or an increase of 10 percent.

To see how tax preferences can affect the after-tax economic performance of a firm, we assume for the moment that there are no implicit taxes. Multiplying both sides of equation (4) by equilibrium pre-

tax return (PTR^*) yields

$$PTR^*(1 - etr) = PTR^*(1 + \lambda)(1 - t^*) \quad (6)$$

We then observe that $PTR^*(1 - etr) = ROE$, the company's actual return on equity, and $PTR^*(1 - t^*) = ROE^*$, the company's equilibrium return on equity, so that

$$ROE = (1 + \lambda)ROE^* \quad (7)$$

To extend our numerical example, we continue to assume that $t^* = 0.40$ and $etr = 0.34$, so that $\lambda = 10$ percent, and we also assume that ROE^* is equal to 12 percent. Under these circumstances ROE will be equal to 13.2 percent $((1 + 0.10)(0.12))$. Thus, assuming there are no implicit taxes, the firm's effective tax rate falls from 40 percent to 34 percent and the after-tax return on equity rises from 12 percent to 13.2 percent, an increase of 10 percent.

Next, we introduce implicit taxes in the form of a "tax" on the preference (λ) so that

$$ROE = (1 + \lambda(1 - \delta))ROE^* \quad (8)$$

where δ is the extent of implicit tax. If we assume an extent of implicit taxes of 80 percent, then observed ROE will be equal to 12.24 percent $((1 + 0.10(1 - 0.80))(0.12))$ in our numerical example. Thus, after-tax return on equity would initially rise from 12 percent to 13.2 percent, or an increase of 10 percent, but implicit taxes would eliminate 80 percent of this benefit so that ROE rises by only two percent $(\lambda(1 - \delta)$ or $0.10(1 - 0.80))$ to 12.24 percent. Equation (8) is the basis for our regression analysis below in which δ is an estimated parameter that captures the extent of implicit taxes.

To estimate δ using (8) we must specify the other variables in the equation. We base each observation's ROE (actual return on equity for the year) and λ (tax preference) on equations (2) and (5) above, respectively. To control for risk, we specify the equilibrium return on equity (ROE^*) as the average ROE for the firm's industry over the 30-year study period (1976 to 2005), so that

$$ROE^* = \overline{ROE}_I \quad (9)$$

where we first calculate annually the total pre-tax income by industry, subtract total tax expense for the industry and divide this difference by the total owners equity for the industry. This yields an industry

measure of return on equity, which we then average across years for each industry.¹⁵

This measure of equilibrium ROE will reflect variation across industries in risk that is relatively constant over time, averaging away annual deviations between firm-specific actual return on equity and expected return on equity¹⁶ This estimate for ROE^* also has the additional important feature that to the extent there are shared accounting biases within industries, such as R&D that is expensed, this measure of ROE will also reflect variation from this source.

We make one final adjustment to \overline{ROE}_I as our measure of equilibrium ROE so that it is before the effects of tax preferences or burdens and implicit taxes. Before the final adjustment, our measure of equilibrium ROE includes tax preferences and implicit taxes that are clustered within industries. Therefore, we convert \overline{ROE}_I to a before-tax-preference basis for the industry by using the relation in (8) at the industry level and dividing by $[1 + \bar{\lambda}_I(1 - \delta)]$ where $\bar{\lambda}_I$ is the average industry tax preference, computed separately for the period before 1986 and for the period after 1985. For each industry in each year, λ_I is given by equation (5) above where etr is the ratio of total tax expense ($TAX\$$) to total pre-tax income (PTI) for each industry-year, and t^* is the ratio of the sum of tax expense across all observations for each period to the sum of pre-tax income across all observations for each period.¹⁷ Thus, we have

$$ROE^* = \frac{\overline{ROE}_I}{[1 + \bar{\lambda}_I(1 - \delta)]} \quad (10)$$

We then substitute (10) back into (8) to get

¹⁵ We use the 48 industries specified by Fama and French (1997). We have observations in 41 of these 48 industries. The other seven industries contain regulated and financial firms that are not represented in our sample. Estimating ROE^* by separately averaging ROE for each industry before and after TRA86 produces virtually identical results.

¹⁶ To establish that this measure is related to variation in risk-related economic returns across industries we computed the cross-industry correlation of the industry's accounting measure of return with the industry's average annual stock market return over the thirty-year sample period. This correlation was 42.0 percent, indicating a significant association between the accounting measure of return and the market measure of return. We also observe that the pattern of the variation in average return on equity for the 30-year study period across the 41 industries in our sample appears to reflect the conventional wisdom of variation in risk across industries. For example, the three industries with the highest average \overline{ROE}_I are tobacco products (34.1 percent), beer and liquor (27.2 percent) and pharmaceutical products (25.7 percent). The three with the lowest average \overline{ROE}_I are entertainment (11.9 percent), textiles (12.0 percent), and coal (12.5 percent).

¹⁷ This specification assumes that the average extent of implicit taxes is the same for tax preferences that are shared within an industry as for tax preferences that are not shared within an industry. We determine λ_I separately pre- and post-1986 because of the dramatic changes we observe in tax preferences in these time periods based on our previous analyses.

$$ROE = \frac{[1 + \lambda(1 - \delta)] \overline{ROE}_t}{[1 + \bar{\lambda}_t(1 - \delta)]} + \varepsilon \quad (11)$$

We use maximum likelihood estimation for equation (11) each year to estimate the annual extent of implicit taxes across the sample (δ).¹⁸ An estimate of δ equal to zero (one) would indicate implicit taxes at the corporate level that offset none (all) of the variation in tax preferences. Estimated values for δ between zero and one would indicate implicit taxes that offset that proportion of tax preferences.

To operationalize our measure of tax preferences, λ from equation (5), we specify the equilibrium tax rate (t^*) for each year as the ratio of the sum of tax expense for all observations that year to the sum of pre-tax income for all observations that year. This represents the tax rate that firms in the sample would have used to compute tax expense that year if they had all used the same rate, and provides a convenient reference point for determining which firms received an explicit tax preference ($etr < t^*$) and which incurred an additional tax burden ($etr > t^*$).¹⁹

In table 5 we report distributional characteristics for the equilibrium tax rate (t^*), and for tax preferences (burdens), which are labeled as λ^+ (λ^-) and are equal to the average or median λ when λ is positive (negative). We find that t^* declines over the study period in the same way as average etr . The average t^* is greater than the average etr in the pre-TRA86 period. Because t^* is value-weighted by construction, this suggests that larger firms have higher-than-average effective tax rates during that period. This pattern affects the distribution of λ^+ and λ^- . The median λ^+ is about ten percent throughout the study period, falling only slightly from 10.2 percent pre-TRA86 to 9.7 percent after TRA86. The magnitudes for the tax burdens, λ^- , are somewhat smaller, with a median of -5.1 percent before TRA86 and -5.6 percent after TRA86. Overall, these results indicate that there is a spread between the median tax preference firm and the median tax burden firm of around 15 percent throughout the study period,

¹⁸ Equation (11) includes an error term because the dependent variable, ROE , measures its underlying constructs, the economic value of after-tax profits minus tax burden, with error. We address the potential effect of error in the measurement of profits and taxes in additional analyses below. Conceptually, equation (11) can be estimated at the firm level (using a time-series of observations for one firm) or at the industry-year level (using a cross-section of firms within the same industry and year), but both of these alternatives would severely restrict the estimation sample. Below, we estimate equation (11) at the industry level before and after TRA86 for industries with sufficient observations.

¹⁹ This specification of t^* allows us to avoid assumptions about the statutory state and local and foreign tax rates, which vary substantially cross-sectionally.

suggesting the potential for measurable implicit taxes both pre- and post-TRA86.

-----INSERT TABLE 5 ABOUT HERE-----

We report annual results for our estimation of equation (11) in table 6. For the period before TRA86 the average estimate of the extent of implicit taxes is 97.5 percent. These ten years include the ten highest estimates for our thirty-year study period, and seven of the coefficient estimates are not significantly different from one. This suggests that implicit taxes eliminated virtually all of the variation in corporate tax preferences prior to TRA86.

During implementation of TRA86, implicit taxes fell sharply from 0.904 in 1985 to 0.795 in 1986, to 0.473 in 1987, and to 0.338 in 1988. There is no evidence that this was a temporary adjustment period, as we observe implicit taxes 15-20 years after TRA86 that are still only about one-third of the implicit taxes immediately before TRA86. In addition, the nineteen lowest estimates occur from 1987 to the end of the study period when the average annual estimate of the extent of implicit taxes is only 33.0 percent. For the full post-TRA86 period, the average extent of implicit taxes reported in table 6 is 0.296, which is significantly different from the average of 0.975 for the pre-TRA86 period ($t = 8.89$, $p\text{-value} < 0.000$). While these measures of the extent of implicit taxes depend on the assumptions underlying our analysis, overall the results are consistent with those presented in tables 2, 3 and 4, and in figure 1, and indicate that after TRA86 implicit taxes are dramatically lower than they were before TRA86.

-----INSERT TABLE 6 ABOUT HERE-----

Measurement of tax burden and performance and additional robustness checks

In this subsection we discuss issues related to the measurement of the key variables in our main analysis and we report additional analyses to check the robustness of our results to changes in our specifications. We first examine issues related to our measurement of tax burden, *TAX*. During our post-TRA86 study period, changes were implemented in the financial reporting rules for tax expense. *APB Opinion No. 11 (APB11)* governed the financial reporting for income taxes for the period surrounding enactment of TRA86 and required the use of NOL carryforwards to be reported as an extraordinary item. Therefore, the Compustat tax expense amounts reflect only the current period tax expense for continuing

operations, so that our measures of tax burden and tax benefit capture tax preferences for each year rather than simply NOL carryover usage. *Statement of Financial Accounting Standards No. 109 (SFAS 109)* modified the reporting of NOL carryforwards such that these items are now allocated between income from continuing operations and other income including extraordinary items. Thus, after 1992 our measures of tax burden and tax benefit will include allocated portions of NOL carryovers from other periods. However, we do not observe a change in our results before and after 1992, and our elimination of loss firms in our original sample likely reduces the potential effect of NOL carryovers.²⁰

We also examine whether an alternative treatment of the tax benefit associated with the ability to defer taxes would affect our results. In the specifications reported above we assume there is no benefit to deferral. As an alternative, we repeat our main analysis assuming a deferral period of five years and a discount rate of ten percent (discount factor of 0.6209). After making this adjustment, the estimate of the extent of implicit taxes is 92.2 (53.9) percent before (after) TRA86, demonstrating a similar significant drop after 1986.

We also examine whether the decline in implicit taxes after TRA86 is due to an increasing use of stock-based compensation that distorts our measure of tax expense. To investigate this possibility, we repeat the main analysis reported in table 6 for two groups: observations from high technology industries that are expected to be heavy users of stock-based compensation and observations in other industries. Consistent with Huson, Scott, and Weir (2001), we classify firms with one-digit SIC codes of 3, 7, and 8 as high technology industry firms (about 54 percent of the sample). Both groups experience a sharp decline in implicit taxes after TRA86. For the high (low) technology group the decline is from 104.4 to 21.8 (95.4 to 34.3). Thus, our results are not sensitive to use of stock options.²¹

Next, we examine the sensitivity of our results to our financial reporting measure of return on equity. First, we consider the potential impact of new accounting standards near 1986. We reviewed

²⁰ SFAS 96 was issued in December 1987 to supersede APB 11. Ayers (1998) reports that 79 percent of his sample of 988 firms with available data did not adopt SFAS 96 before it was superseded by SFAS 109 in 1992.

²¹ We also find no systematic pattern during the post-TRA86 period as usage of stock-based compensation was likely to be increasing. For the high (low) technology group the extent of implicit taxes is 15.7 (39.5) for the early part of the post-TRA86 period (1988–96), and 27.9 (29.1) for the later part of the post-TRA86 period (1997–2005).

accounting standards adopted about this time and the only standard that appears to be pervasive enough to potentially affect our large sample is *SFAS 87 – Employers’ Accounting for Pensions*, which was effective for fiscal years beginning on or after December 15, 1986.²² We repeat our main analysis from table 6, partitioning the sample into firms reporting (68 percent) and not reporting (32 percent) pension expense. Both groups experience a sharp decline in implicit taxes after TRA86. For the pension group the decline is from 108.6 to 31.3 percent, and for the no-pension group the decline is from 77.9 to 25.5 percent.

We also repeated our analysis reported in table 6 after adjusting our measures of return on equity by (a) derecognizing intangible assets, (b) capitalizing and amortizing research & development expense, (c) valuing inventory on a FIFO basis, and (d) capitalizing operating leases on the balance sheet. After making these adjustments, the average estimate for implicit taxes fell from 104.8 percent before TRA86 to 27.4 percent after TRA86.²³

We also considered the potential effect of earnings management. If firms with low effective tax rates in the post-TRA-86 period managed their *PTR* upwards consistent with evidence reported in Frank et al. (2010), then earnings management by firms with low tax burdens after TRA86 might explain the decrease in implicit taxes. To examine this possibility, we estimate discretionary accruals using the performance-matched procedure (Kothari et al. 2005) as described in Frank et al (2010, pages 479-80). We limit this computation to observations in 1989 through 2005, when data from the statement of cash flows are available (Hribar and Collins 2002). We compute the average discretionary accruals each year for the 40 percent of firms with the highest (lowest) tax preferences (λ), which we designate as our low-tax (high-tax) groups. We then tax-effect the discretionary accruals by multiplying by one minus *etr* and deflate by owners’ equity. We find that these discretionary accruals are higher for the low-tax group in 13 of 17 years, and the average difference for the 17 years over which we conduct this analysis is 0.006 (t = 3.48). This is in the correct direction to potentially contribute to relatively low implicit taxes after TRA86, but the magnitude accounts for less than 20 percent of the *ROE* difference between the high and low tax

²² The next earlier (later) pervasive accounting standard was *SFAS 52 – Foreign Currency Translation* (*SFAS 106 – Employers’ Accounting for Postretirement Benefits Other Than Pensions*) which was effective in 1983 (1993). Standards between *SFAS 52* and *SFAS 106* other than *SFAS 87* are either technical or apply to narrow industries.

²³ Details are available from the authors on request.

groups reported in table 2 of 0.032 (0.195 – 0.163).

To more directly investigate the potential effect of this earnings management on our main estimates of implicit taxes in table 6, we re-estimate implicit taxes for 1989 through 2005 after replacing reported *ROE* with “unmanaged” *ROE* by adding back our estimate of after-tax discretionary accruals scaled by beginning owners’ equity to reported *ROE*. After making this change, we find that the average rate of implicit taxes for 1989-2005 is 0.324, compared with an average for these years using the same observations and as-reported *ROE* of 0.354. Thus, this adjustment for earnings management has virtually no effect on our estimate of implicit taxes following TRA86.²⁴

5 Corroborating empirical evidence of a decline in implicit taxes following TRA86

In this section we provide additional corroborating evidence for the change in implicit taxes documented above by investigating three additional implications of this decline in implicit taxes. The first is related to whether *changes* in tax preferences are accompanied by changes in pre-tax returns. The second is related to the persistence of earnings benefits from tax rate changes. The third is related to whether investors factor this dramatic change in implicit taxes into security prices.

Is the decline in implicit taxes reflected in changes in tax preferences and profitability?

As we discuss above, theoretical research in economics concludes that the incidence of corporate income taxes depends on the mobility of capital and labor, and the extent to which firms are able to resist price increases from their suppliers or impose price increases on their customers. In the context of implicit taxes, this suggests that firms that experience an increase in tax preferences will experience a subsequent decrease in pre-tax returns as capital flows toward that tax preference, increasing pressure on input and output prices. To examine this process both before and after TRA86, we estimate the following cross-sectional regression each year.

²⁴ Another issue related to the measurement of *ROE* and *TAX* is the provision in TRA86 of an alternative minimum tax (AMT) for corporations. During 1987 and 1988, a transition period for TRA86, book income was a component of the AMT calculation for corporations, providing an incentive to shift book income to before 1987 or after 1989 (Shackelford and Shevlin 2001). However, subsequent to that transition period the main effect of AMT is to reduce tax preferences, which is reflected in our tax preference measure (λ). Moreover, US Treasury Department (2005) reports that the effect of AMT declined throughout our post-TRA86 study period, but we observe no similar pattern of change in the extent of implicit taxes. Thus, we do not investigate this issue further.

$$\Delta\lambda_t = \gamma_0 + \gamma_1\Delta PTR_t + \gamma_2\Delta PTR_{t+1} + \gamma_3\Delta PTR_{t+2} + \varepsilon \quad (12)$$

Our focus is on the coefficient estimate for the contemporaneous change in pre-tax income (γ_1). If implicit taxes offset the benefits from tax preferences, we would expect γ_1 to be negative, indicating changes in tax preferences are inversely associated with changes in PTR . We find that the average coefficient before TRA86 is -0.177 (t = -10.65), which then rises to 0.045 (t = 2.78) after TRA86. The significantly negative coefficient in the pre-TRA86 period is consistent with the evidence of strong implicit taxes presented above. The significantly positive coefficient in the post-TRA86 period suggests that when tax preferences are rising (positive $\Delta\lambda$) PTR is actually rising. This is not consistent with implicit taxes, but is consistent with conclusions in U.S. Department of Treasury (1999) that tax planning and use of tax shelters is likely to result in lower taxable income and etr , but not lower book income or PTR . We explore this possibility further below.

Is the decline in implicit taxes reflected in the persistence of tax-related earnings changes?

In this section we examine the effect of TRA86 on the immediate year-over-year persistence of the earnings effects of tax preference changes. We follow Schmidt (2006), who investigates the persistence of earnings changes arising from changes in firms' effective tax rates. Although implicit taxes are not the focus of his study, the analysis he conducts has implications for implicit taxes.²⁵ To see this, consider equation (2) from Schmidt (2006), which is

$$E_{t+1} = \gamma_0 + \gamma_1 ATE_t + \gamma_2 TCC_t + \varepsilon_{t+1} \quad (13)$$

Where E_{t+1} is earnings before extraordinary items for year t+1, ATE_t is equal to after tax earnings based on the prior year's effective tax rate, and TCC_t is the effect on earnings in period t of the change in the effective tax rate from t-1 to t.²⁶ In equation (13), the coefficient estimate on TCC captures the persistence of the earnings effect of this year's change in effective tax rates. If implicit taxes are immediate and complete, we would expect this coefficient to be zero because any change in effective tax rates this year that are expected to persist into future periods would be offset in pre-tax returns in those

²⁵ Schmidt (2006) explicitly assumes that implicit taxes are too small to affect his inferences (see footnote 20).

²⁶ More specifically, $ATE_t = PTE_t(1 - etr_{t-1})$ and $TCC_t = PTE_t(etr_{t-1} - etr_t)$, and PTE_t is pre-tax earnings before extraordinary items for period t.

periods. While it may not be realistic to expect that implicit taxes will be manifest that quickly, we expect that if implicit taxes declined following TRA86 in the way that we document above, then we should be able to observe an increase in the tax persistence coefficient from equation (13) following TRA86.

To investigate this possibility we estimate equation (13) each year from 1977 to 2004 for all observations in our sample with available data. The (untabulated) average coefficient estimate before TRA86 is 0.600, compared with 0.727 after, an increase of more than 20 percent. In contrast, the coefficient estimate for *ATE* decreased slightly from the pre-TRA86 period (0.798) to the post-TRA86 period (0.783). These results are consistent with an increase in the persistence of tax-related changes in earnings caused by a decrease in implicit taxes following TRA86.²⁷

Is the decline in implicit taxes reflected in security prices?

The decline in implicit taxes documented in tables 2, 3, 4, and 6, and the results in the previous two subsections, suggest that after TRA86 there was a dramatic increase in the extent to which tax preferences benefit shareholders rather than customers, suppliers, and employees. If this is the case, we should be able to see the effect of this change in the market valuation of firms that received tax preferences after 1986. A meaningful shift in implicit taxes should be priced in the stock market because it is visible to investors as variation in after-tax accounting rates of return. To examine this, we compute the average book-to-market ratio and the book-to-market ratio difference for the high- and low-tax-preference groups. If investors observed the decline in implicit taxes after TRA86, the relative market value of the high tax preference firms should increase after 1986. This will cause a relative decline in the book-to-market ratios for these firms. Thus, we expect an *increase* in the book-to-market ratio *difference* after 1986 where the difference is computed as the average for the low tax preference group minus the average for the high tax preference group.²⁸

The results for this analysis are reported in table 7. The first two columns report the average annual book-to-market ratio for the low and high tax preference groups, respectively, and the third

²⁷ More immediately surrounding enactment of TRA86, we observe that the average coefficient estimate for *TCC* rose from 0.558 for the period from 1981 to 1985 to 0.721 for the period 1988 to 1992, an increase of 29.2 percent.

²⁸ We are grateful to Dain Donelson for suggesting this analysis.

column reports the low-minus-high difference. We have no expectation for the years before TRA86, but we observe that this difference is negative in every year from 1976 through 1986. Beginning in 1987 this difference is positive for every year in the remainder of the study period.

-----INSERT TABLE 7 ABOUT HERE-----

This increase in the book-to-market ratio difference at the time of TRA86 is consistent with a sharp increase in the relative valuation of high tax preference firms after TRA86. Further, the magnitude of this change ($0.058 - (-0.065) = 0.123$) is consistent with the relative improvement in return on equity for high tax preference firms after TRA86. To see this, consider an example in which a firm is in a “steady state” with expected return on equity of 16.6 percent (the post-TRA86 average for low tax preference firms in our sample), cost of capital of 12 percent, and expected growth of 6 percent. Under these assumptions, it can be shown that the firm’s book-to-market ratio will be the reciprocal of $[1 + (0.166 - 0.12)/(0.12 - 0.06)] = 0.566$. If this firm experiences a permanent increase in expected return on equity to 19.4 percent (the post-TRA86 average for high tax preference firms in our sample), its book-to-market ratio will fall to the reciprocal of $[1 + (0.194 - 0.12)/(0.12 - 0.06)] = 0.448$. This decline of 0.118 is strikingly similar to the decline for the high tax preference firms relative to the low tax preference firms reported in table 7 of 0.123.²⁹ These results indicate that the change in implicit taxes that we document in tables 2, 3, 4, and 6 is observed by investors and reflected in security prices.

6. Potential explanations for the decline in implicit taxes

In this section we provide preliminary evidence on potential explanations for the decline in the extent of implicit taxes at the corporate level following TRA86. We examine two potential explanations that are likely to affect a wide range of firms, a decline in the level of competition and an increase in tax planning and use of tax shelters.

²⁹ In this example, “steady state” describes a firm in which all components of the financial statements are growing at the same terminal rate and the firm’s expected return on equity is constant for the infinite future (see Lundholm and Sloan (2004), page 210 for formula and surrounding pages for discussion). We also repeated this analysis after redefining high and low tax preferences as the extreme 25 percent of the distribution of λ rather than the extreme 40 percent, and the low-high difference was -0.060 in the pre-TRA86 period and 0.076 in the post-TRA86 period.

The potential role of competition

As discussed above, Callihan and White (1999) and Salvador and Vendrzyk (2006) report results that indicate that market power is positively related to a firm's ability to retain the benefits of tax preferences because firms with market power face less competition in output markets, an important mechanism for equalizing after-tax rates of return. Thus, it is possible that the decline in implicit taxes that we observe is due to a decline in the intensity of competition faced by firms in our sample.

To investigate this possibility we first examine whether the overall level of competition in the economy changed during the period surrounding TRA86. We follow Hou and Robinson (2006) and use a Herfindahl Index to measure industry concentration, which is an inverse measure of the level of competition in the industry.³⁰ We compute the average concentration ratio for each industry for 1983-1985 and then for 1988-1990, and then we average these "pre" and "post" concentration ratios across the 41 industries in our sample. The average for the pre-TRA86 period (post-TRA86 period) is 0.174 (0.169), and the difference is not significantly different from zero ($t = 0.17$). This is not consistent with a general decline in competition following 1986³¹

Next, we investigate whether the decline in implicit taxes was concentrated in industries with high levels of both competition and implicit taxes prior to TRA86. These industries in particular have the potential for a decline in competition to result in a corresponding decline in implicit taxes. To examine this we estimate industry-specific implicit taxes before and after TRA86 for Fama-French industries with at least 1,000 firm-year observations for both the period before and after TRA86. Seven industries meet this data requirement. For five of these industries (construction materials, machinery, electronic equipment, wholesale, and retail) competition is relatively high before TRA86 (Herfindahl Index below

³⁰ The Herfindahl Index is calculated as the sum of squared market shares of all firms in an industry. We measure a firm's market share as its sales divided by the sum of the sales of all firms in its industry. We compute these industry concentration measures for each of our 41 Fama-French industries, for each year in the study period.

³¹ We also partition the sample based on the annual median industry concentration into high concentration (low competition) and low concentration (high competition) industries, and repeat our main analysis. For firms in high (low) competition industries our estimate of the extent of implicit taxes before TRA86 is 120.8 (85.3) percent, which is consistent with prior research that finds a positive relation between extent of implicit taxes and level of competition. The estimate for the high (low) competition group falls to 23.6 percent (29.7 percent) following TRA86, providing additional evidence that implicit taxes declined more for industries with more competition.

0.10 in all cases), but none experienced a substantial change in concentration after TRA86. The average concentration ratio for these five industries rose slightly from 0.058 before TRA86 to 0.062 after TRA86, but implicit taxes declined sharply from before to after TRA86. The average extent of implicit taxes for these industries fell from 1.42 before TRA86 to 0.03 after TRA86.³² These results provide some evidence that the decline in implicit taxes was concentrated in industries with high levels of competition prior to TRA86, but was not associated with a decline in competition.³³

The potential role of tax planning and tax shelters

In this subsection we examine the possibility that aggressive tax planning and use of tax shelters after TRA86 may have contributed to the decline in the extent of implicit taxes at the corporate level. As discussed above, a large group of studies provides evidence that firms actively responded to TRA86 in many ways (Scholes and Wolfson 1990; Collins and Shackelford 1992; Givoly et al. 1992; Scholes et al. 1992; Harris 1993; Klassen et al. 1993; Guenther 1994a; and Maydew 1997). Additional research provides evidence that in recent decades firms have become more aggressive in tax planning, in response to both competitive pressure and to compensate for preferences lost to tax provision changes in TRA86 (Mills et al. 2002; Plesko 2004). Bankman (1999) suggests that following TRA86 there were fewer traditional tax preferences, opening up a market for more corporate tax shelters.

After TRA86 firms could no longer simply buy new assets or invest in R&D projects to obtain tax credits, and there is anecdotal evidence that they turned to alternative less obvious tax planning that developed into tax products sold by accounting and law firms.³⁴ For example, a US Treasury report (1999) describes TRA86 as a major contributing factor to the growth in corporate tax shelters. The

³² One industry, business services, had a relatively high Herfindahl Index of 0.210 (low competition) before TRA86, which fell to 0.123 after TRA86, indicating an increase in competition. For this industry, the extent of implicit taxes declined less sharply, from 0.66 before TRA86 to 0.40 after TRA86. The other industry, petroleum and natural gas, had relatively high competition both before and after TRA86 (Herfindahl Index of 0.078 (0.122) before (after) TRA86), the extent of implicit taxes declined less sharply, from 0.58 before TRA86 to 0.33 after TRA86.

³³ We repeated this analysis after requiring industries to have only 500 firm-year observations rather than 1,000 which added 15 industries to our analysis, but did not change the overall pattern of results.

³⁴ A report by the U.S. Senate Permanent Subcommittee on Investigations (2005) identifies tax products as ideas whose “objective was not to achieve a specific business or economic purpose, but to reduce or eliminate a client’s U.S. tax liability” (p.9). These tax products represent ideas that were mass marketed to multiple clients and often required participants to sign confidentiality agreements regarding the nature of the strategy.

elimination of tax preferences motivated corporations to seek new ways to produce tax savings at the same time that TRA86 increased the supply of tax shelter specialists (US Treasury 1999). Thus, corporations were primed to buy more sophisticated and complex tax products sold by tax specialists (Bankman 1999). Corporate officers were often required to sign confidentiality agreements to prevent an idea from becoming widely known and therefore a “target for Congress and the tax cops” (Novack and Saunders 1998). These products and other forms of aggressive tax planning are likely to depend more on specific, finite-lived transactions that are less transitory, and are unlikely to be widely observable or replicable by other market participants. This combination of transitory tax benefits and lack of transparency associated with the proprietary nature of the tax shelters makes it more difficult for competitive market forces to continue to equalize after-tax returns as before TRA86.

We begin this analysis by examining whether the persistence of tax preferences declined after TRA86. Such a decline may indicate tax preferences that are less integrated into the ongoing business activities of the firm and are more likely to be the result of tax planning or tax shelters. More importantly for implicit taxes, such a decline in persistence suggests tax preferences that are less likely to be offset by shifts in resources toward these (temporarily) tax-advantaged activities. To investigate this issue, we first compute the average absolute change in tax preferences (λ) for observations before and after TRA86. This value is 0.098 prior to TRA86, and rises to 0.126 after TRA86, an increase of 29 percent. Focusing more closely on the years surrounding TRA86, we find that the average absolute change in tax preferences for 1981-1985 is 0.107, rising to 0.161 for the period 1988-1992, an increase of more than 50 percent. These results indicate greater volatility in tax preferences from one year to the next after TRA86 than before, and are consistent with less persistent tax preferences after TRA86.

Next, we directly estimate the persistence of lambda before and after TRA86 by estimating the following cross-sectional regression each year³⁵

$$\lambda_{t+1} = \gamma_0 + \gamma_1 \lambda_t + \varepsilon \tag{14}$$

³⁵ This analysis differs from that conducted by estimating equation (13), above. Equation (13) examines the persistence of changes in income resulting from changes in explicit taxes (tax preferences), which is a measure of the effectiveness of implicit taxes. In contrast, equation (14) examines the persistence of tax preferences themselves and provides no direct evidence on the effectiveness of implicit taxes.

The results (untabulated) indicate that the average persistence coefficient (γ_1) fell from 0.609 in the pre-TRA86 period to 0.378 in the post-TRA86 period, and this decrease of about 38 percent is statistically significant ($t = 5.79$). Focusing more closely on the years surrounding TRA86, we find that the average persistence coefficient for 1981-1985 is 0.581, falling to 0.448 for the period 1988-1992, and this decrease of about 23 percent is significant at the four percent confidence level ($t = 2.20$). Taken together, these results indicate that tax preferences have greater volatility and less persistence from one year to the next after TRA86 than before, and are therefore less likely to be bid away by competitive forces.

Next, we examine the role of five firm-specific characteristics that have been found to be associated with tax planning and tax shelter activity (Mills et al. 1998; Graham and Tucker 2006; Dyreng et al. 2008; Wilson 2009; Lisowsky 2010): pre-tax returns (*PTR*), leverage (*Lev*), foreign operations (*FOR*), intangibles intensity (*RD*), and firm size (*SIZE*).³⁶

Dyreng et al. (2008) report that firms with low long-run cash tax expense between 1995 and 2004 report higher pre-tax profitability than firms with high long-run cash tax expense for that same period. Wilson (2009) and Lisowsky (2010) include a measure of pre-tax profitability in their models of tax shelter activity because they expect that firms that are more profitable are more likely to engage in tax shelters. They both report empirical evidence that this is the case. Above, we provide evidence in figure 1 that the difference in pre-tax returns between firms with high and low tax preferences narrowed dramatically following TRA86. We provide an alternative representation of this in figure 2, where we compute the ratio of the average *PTR* for low tax observations (top 40 percent on λ) to the average *PTR* for high tax observations (bottom 40 percent on λ). This ratio (*R_PTR*) increases from an average value of 0.699 in the pre-TRA86 period to an average of 0.919 in the post-TRA86 period, and the increase occurs abruptly at the time of TRA86.

³⁶ Wilson (2009) also considers the role of discretionary accruals, but we do not include this measure in our analysis because we found in our earlier test that earnings management had a very limited effect on implicit taxes in the post-TRA86 period and including it here would severely restrict our sample. We also note that foreign sales and intangibles intensity may also be related to a firm's normal business operations without engaging in extra tax planning or tax shelter activity. Thus, evidence of an association between an increase in these activities and a decline in implicit taxes could be the result of general trends in the economy rather than concerted tax planning activities.

-----INSERT FIGURE 2 ABOUT HERE-----

Graham and Tucker (2006) examine 44 tax shelter cases spanning three decades, and report results that indicate that corporations using tax shelters substitute away from debt and decrease leverage. Dyreng et al. (2008) report that firms with low long-run cash tax expense between 1995 and 2004 report higher leverage than firms with high long-run cash tax expense for that same period. Using a sample that includes these tax shelter cases from Graham and Tucker (2006), Wilson (2009) and Lisowsky (2010) provide evidence that leverage is negatively related to shelter activity. We demonstrate the relationship between leverage and tax preferences for our sample graphically in figure 2, where we compute the ratio of the average *Lev* for low tax observations (top 40 percent on λ) to the average *Lev* for high tax observations (bottom 40 percent on λ). This ratio (*R_Lev*) declines from an average value of 1.335 in the pre-TRA86 period to an average of 0.812 in the post-TRA86 period, and most of the decline appears to occur at the time of TRA86. This indicates that relative to firms with low tax preferences, firms with high tax preferences relied less on debt to finance their operations after TRA86.

A 2008 study by the GAO concluded that lower effective tax rates on foreign source income is a significant and growing source of the cross-sectional variation in overall corporate effective tax rates (GAO 2008). Mills et al. (1998) provide evidence that firms with foreign operations invest more in tax planning than other firms. Wilson (2009) and Lisowsky (2010) provide evidence that foreign income is positively associated with the likelihood of engaging in tax shelter activity. We demonstrate the relationship between foreign operations and tax preferences for our sample graphically in figure 2, where we compute the ratio of the average *FOR* for low tax observations (top 40 percent on λ) to the average *FOR* for high tax observations (bottom 40 percent on λ). This ratio (*R_FOR*) increases from an average value of 1.219 in the pre-TRA86 period to an average of 1.630 in the post-TRA86 period, and the increase continues throughout the post-TRA86 period.³⁷

³⁷ To investigate the role of foreign activity in our main results, we repeated the analysis reported in table 6 after removing the top 25 percent of sample observations on the basis of the ratio of foreign sales to total sales. In (untabulated) results we find that implicit taxes eliminated 106.9 (31.8) percent of the tax preferences prior to (after) enactment of TRA86. This indicates that the decline in implicit taxes is largely unaffected by removing firms with substantial foreign operations and provides no evidence that the decline in implicit taxes after TRA86 is directly due to differences between high and low tax preference firms in their level of foreign activity.

The role of intangible assets and intellectual property in firms' operations has been growing in recent decades. Hanlon et al. (2007) argue that these assets lend themselves to using transfer pricing to shift income into low tax jurisdictions and Grubert (2003) and Chen et al. (2010) report supporting evidence. We demonstrate the relationship between intellectual property and tax preferences for our sample graphically in figure 2, where we compute the ratio of the average *RD* for low tax observations (top 40 percent on λ) to the average *RD* for high tax observations (bottom 40 percent on λ). This ratio (*R_RD*) increases from an average value of 1.622 in the pre-TRA86 period to an average of 2.411 in the post-TRA86 period, and the increase appears to begin before TRA86 and continue after TRA86.³⁸

Finally, Dyreng et al. (2008) report that firms with low long-run cash tax expense between 1995 and 2004 are larger than firms with high long-run cash tax expense for that period. In addition, Wilson (2009) and Lisowsky (2010) provide evidence that firm size is positively related to the likelihood that firms engage in tax shelter activity. We illustrate the relationship between firm size and tax preferences for our sample graphically in figure 2, where we compute the ratio of the average *SIZE* for low tax observations (top 40 percent on λ) to the average *SIZE* for high tax observations (bottom 40 percent on λ). This ratio (*R_SIZE*) declines from an average value of 1.088 in the pre-TRA86 period to an average of 1.000 in the post-TRA86 period, and the decline occurs gradually throughout the sample period.

We directly examine the effect on implicit taxes of these changes in relative firm characteristics between firms with high and low tax preferences by estimating the following regression

$$\hat{\delta}_t = \gamma_0 + \gamma_1 R_PTR_t + \gamma_2 R_Lev_t + \gamma_3 R_FOR_t + \gamma_4 R_RD_t + \gamma_5 R_SIZE_t + \varepsilon_t \quad (15)$$

where $\hat{\delta}_t$ is our estimate of the extent of implicit taxes for year t based on our estimation of equation (11) and reported in table 6. All of the other variables are as defined above. The results for equation (15) are reported in table 8. In the first five rows we consider each of the independent variables individually. All of the coefficient estimates are significant in the expected direction, indicating that each of these variables

³⁸ To investigate the role of research and development in our main results, we repeated the analysis reported in table 6 after removing the top 25 percent of sample observations on the basis of the ratio of R&D expense to total sales. In (untabulated) results for this subsample, we find that implicit taxes eliminated 93.0 (30.4) percent of the tax preferences prior to (after) enactment of TRA86. This indicates that the decline in implicit taxes is largely unaffected by removing firms with substantial R&D and provides no evidence that the decline in implicit taxes after TRA86 is directly due to differences between high and low tax preference firms in their level of R&D activity.

is related to variation in our estimate of implicit taxes over time. The final row provides results for all five variables taken together, where only the coefficient estimates for R_PTR and R_Lev are statistically significant. The results in table 8 provide some evidence that is consistent with increases in tax planning and tax shelters that are costly to replicate as at least a partial explanation for the decline in implicit taxes.

-----INSERT TABLE 8 ABOUT HERE-----

7 Conclusion

This study examines the extent to which the tax preferences of low-tax rate firms are offset by implicit taxes at the corporate level and the effect of the Tax Reform Act of 1986 on that process. We examine a large sample of 75,000 firm-year observations over 30 years, 1976-2005. For several alternative analyses we find an abrupt and substantial decline in implicit taxes immediately following 1986, indicating a structural shift in the extent of implicit taxes after enactment of TRA86. Using an analysis that estimates the extent of implicit taxes, we find that prior to TRA86 firms lose virtually all of the benefits of tax preferences to implicit taxes while after enactment of TRA86 firms lose only about one-third of tax preferences to implicit taxes. Moreover, this reduced extent of implicit taxes continues for twenty years following TRA86. Also, in additional tests we report three findings that triangulate our results that implicit taxes declined following TRA86 by providing additional corroborating evidence for this decline. First, we find evidence after TRA86 of a decline in the relation between changes in tax preferences and changes in pre-tax returns. Second, we find an increase in the persistence of tax-related earnings changes. Third, we find that these dramatic economic changes are priced by investors. Finally, we provide evidence suggesting that the decline in implicit taxes after TRA86 is driven at least in part by expansion of aggressive tax planning and use of tax shelters, but we leave a more thorough investigation of this explanation to future research.

These results have important implications for tax policy. The results provide evidence that prior to TRA86 the tax preferences provided to corporations were accomplishing their intended goal of attracting capital to low explicit tax rate activities. As a result, shareholders in the corporate recipients of the tax preferences were not the ultimate beneficiaries. In contrast, the results for the period after TRA86

provide evidence this process is no longer working as completely. This suggests that in the current environment much of the benefits of corporate tax preferences are reflected in after-tax income and share prices, and are thus retained by the shareholders of those corporations.

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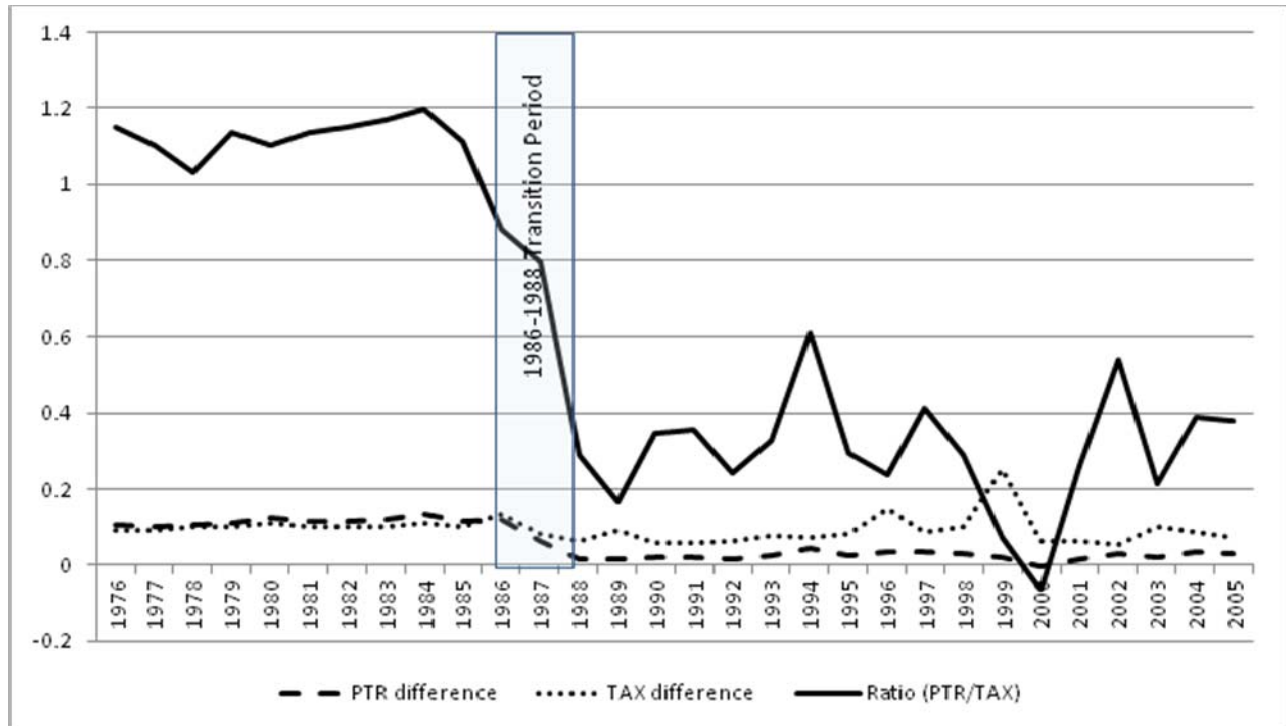
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FIGURE 1
Taxes, Pre-tax Return, and Ratio(PTR/TAX) by Year

Panel A: Differences in pre-tax returns, differences in taxes, and the ratio of the differences by high and low tax groups

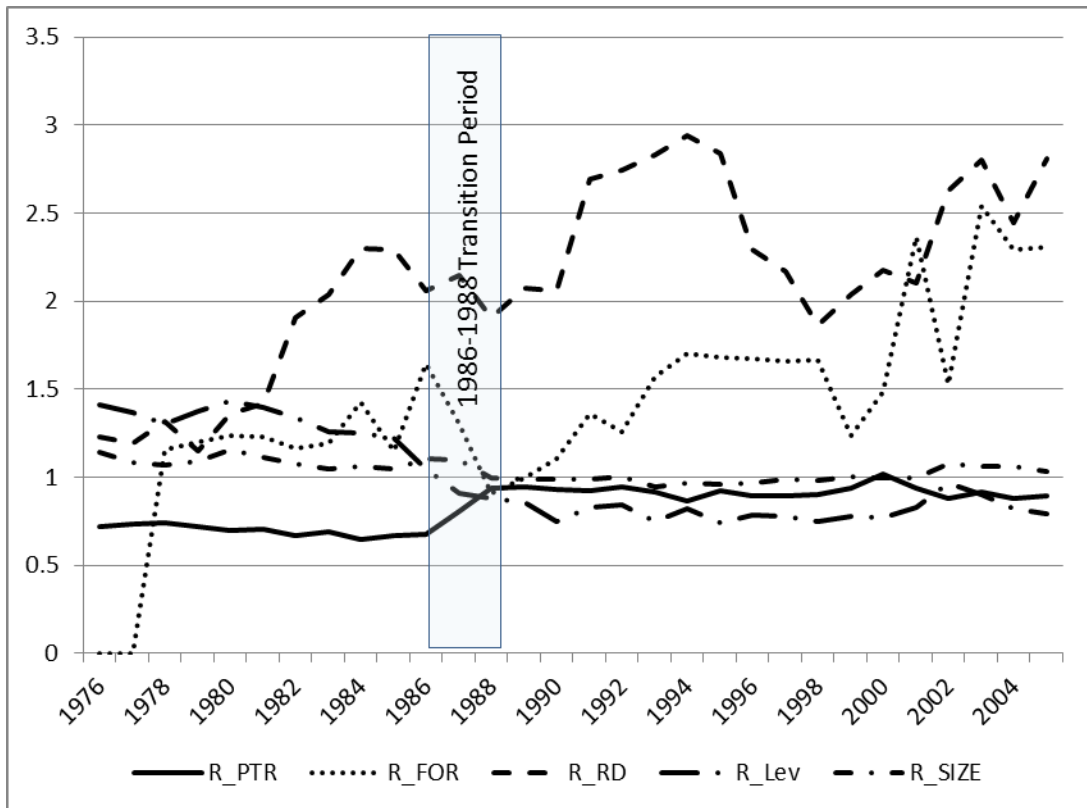


* All variables are winsorized at the 1% and 99% levels. The tax groups are formed using the highest 40 percent of the *etr* distribution (high tax -group) and the lowest 40 percent of the *etr* distribution (low tax-group) for each year.

Variable Definitions:

- etr* = Effective tax rate, measured as the total tax expense divided by pre-tax income before special items. Effective tax rate with values greater (less) than one (zero) set to one (zero). Pretax income before special items equals $data170 - data17$, where $data17$ is set to zero if missing. Total tax expense is $data16$ less special items multiplied by *etr* before adjustments for special items.
- PTR difference* = Difference between the high and low tax groups' average pre-tax return, where pre-tax return is measured as PTI/OE where $PTI = data170 - data17$, where $data17$ is set to zero if missing and $OE = data60_{t-1}$
- TAX difference* = Difference between the high and low tax groups' average effective tax rate, where the effective tax rate is measured as the total tax expense divided by pre-tax income before special items. Effective tax rate with values greater (less) than one (zero) set to one (zero). Pretax income before special items equals $data170 - data17$, where $data17$ is set to zero if missing. Total tax expense is $data16$ less special items multiplied by *ETR* before adjustments for special items.
- Ratio (PTR/TAX)* = Average annual *PTR* difference divided by the average annual *TAX* difference.

FIGURE 2
Relative Firm Characteristics for High and Low Tax Preference Observations



* All variables are winsorized at the 1% and 99% levels. For each ratio high (low) tax observations are in the top (bottom) 40 percent of the λ distribution where λ is a measure of a firm's annual tax preference or burden, defined as $[(t^* - etr)/(1 - t^*)]$.

Variable Definitions:

- etr* = Effective tax rate, measured as the total tax expense divided by pre-tax income before special items. Pretax income before special items equals data170 – data17, where data17 is set to zero if missing. Total tax expense is data16. Effective tax rate with values greater (less) than one (zero) are set to one (zero).
- t** = The ratio of the sum of total tax expense (data16) to the sum of pre-tax income before special items (data170 – data17) for all observations each year.
- R_PTR* = The ratio of the average *PTR* for low tax observations to the average for high tax observations, where *PTR* is pre-tax return measured as $PTR = PTI/OE$ where $PTI = data170 - data17$, where data17 is set to zero if missing and $OE = data60_{t-1}$.
- R_Lev* = The ratio of the average *Lev* for low tax observations to the average for high tax observations, where *Lev* is the ratio of long-term debt to total assets
- R_FOR* = The ratio of the average *FOR* for low tax observations to the average for high tax observations, where *FOR* is the ratio of foreign sales to total sales, both in the current year
- R_RD* = The ratio of the average *RD* for low tax observations to the average for high tax observations, where *RD* is the ratio R&D expense to sales, both for the current year.
- R_SIZE* = The ratio of the average *SIZE* for low tax observations to the average for high tax observations, where *SIZE* is the natural log of total assets

TABLE 1
Descriptive Statistics of Firm Characteristics and Primary Analyses Variables

Pre-TRA86 (1976-1985)
N=26,283

	Mean	Q1	Median	Q3	Std Dev
<i>PTR</i>	0.326	0.185	0.285	0.408	0.210
<i>ROE</i>	0.185	0.109	0.162	0.229	0.117
<i>etr</i>	0.418	0.380	0.441	0.476	0.102

Post-TRA86 (1988-2005)
N=44,024

	Mean	Q1	Median	Q3	Std Dev
<i>PTR</i>	0.284	0.137	0.234	0.362	0.218
<i>ROE</i>	0.183	0.087	0.150	0.233	0.146
<i>etr</i>	0.357	0.318	0.370	0.399	0.138

Variable Definitions:

- PTR* = Pre tax return, measured as pre-tax income before special items / beginning of year owners' equity. Pretax income before special items equals data170 – data17, where data17 is set to zero if missing. Beginning of year owners' equity equals the prior year value of data60. *PTR* is winsorized annually at the 1% and 99% levels.
- ROE* = After tax return on equity, measured as pre-tax income before special items less total tax expense divided by beginning of year owners' equity. Pretax income before special items equals data170 – data17, where data17 is set to zero if missing. Beginning of year owners' equity equals the prior year value of data60. Total tax expense is data16. *ROE* is winsorized annually at the 1% and 99% levels.
- etr* = Effective tax rate, measured as the total tax expense divided by pre-tax income before special items. Effective tax rate with values greater (less) than one (zero) set to one (zero). Pretax income before special items equals data170 – data17, where data17 is set to zero if missing. Total tax expense is data16 less special items multiplied by *etr* before adjustments for special items.

TABLE 2
Analysis of Differences in PTR and TAX for High and Low Tax Groups Pre- and Post-TRA86

	Pre-TRA86 1976-1985	Post-TRA86 1988-2005	Difference
High Tax Group			
<i>PTR</i>	0.379	0.288	0.091
<i>TAX</i>	0.191	0.157	0.034
Low Tax Group			
<i>PTR</i>	0.265	0.264	0.001
<i>TAX</i>	0.090	0.069	0.021
Difference			
<i>PTR</i>	0.114	0.024	
<i>TAX</i>	0.101	0.088	
Ratio (<i>PTR/TAX</i>)	1.129	0.273	

* The high-tax group includes observations in the highest 40 percent of the *etr* distribution and the low-tax group includes observations in the lowest 40 percent of the *etr* distribution for the respective year.

Variable Definitions:

- PTR* = Pre tax return, measured as pre-tax income before special items / beginning of year owners' equity. Pretax income before special items equals $data170 - data17$, where $data17$ is set to zero if missing. Beginning of year owners' equity equals the prior year value of $data60$. *PTR* is winsorized annually at the 1% and 99% levels.
- TAX* = Tax expense, measured as total tax expense divided by beginning of year owners' equity.
- PTR difference* = Difference between the high and low tax groups' average pre-tax return, where pre-tax return is measured as PTI/OE where $PTI = data170 - data17$, where $data17$ is set to zero if missing and $OE = data60_{t-1}$
- TAX difference* = Difference between the high and low tax groups' average effective tax rate, where the effective tax rate is measured as the total tax expense divided by pre-tax income before special items. Effective tax rate with values greater (less) than one (zero) set to one (zero). Pretax income before special items equals $data170 - data17$, where $data17$ is set to zero if missing. Total tax expense is $data16$ less special items multiplied by *ETR* before adjustments for special items.
- Ratio (*PTR/TAX*) = Average annual *PTR difference* divided by the average annual *TAX difference*.

TABLE 3
Results of Correlation Analysis between ROE and Effective Tax Rates

Year	Correlation		Correlation	
	(PTR, <i>etr</i>)	p-value	(ROE, <i>etr</i>)	p-value
1976	0.238	<0.001	0.310	0.094
1977	0.210	<0.001	-0.011	0.535
1978	0.232	<0.001	0.012	0.509
1979	0.259	<0.001	0.056	0.003
1980	0.214	<0.001	0.006	0.751
1981	0.214	<0.001	0.016	0.403
1982	0.194	<0.001	0.001	0.968
1983	0.192	<0.001	0.010	0.613
1984	0.221	<0.001	0.032	0.111
1985	0.175	<0.001	-0.021	0.315
1986	0.168	<0.001	-0.018	0.391
1987	0.038	0.064	-0.135	<0.001
1988	-0.026	0.209	-0.217	<0.001
1989	-0.028	0.180	-0.224	<0.001
1990	0.022	0.299	-0.169	<0.001
1991	-0.020	0.346	-0.186	<0.001
1992	-0.038	0.065	-0.212	<0.001
1993	-0.022	0.260	-0.219	<0.001
1994	0.061	0.001	-0.131	<0.001
1995	-0.003	0.859	-0.225	<0.001
1996	0.016	0.360	-0.256	<0.001
1997	0.026	0.137	-0.224	<0.001
1998	0.024	0.198	-0.247	<0.001
1999	-0.015	0.448	-0.219	<0.001
2000	-0.063	0.002	-0.258	<0.001
2001	-0.071	0.001	-0.248	<0.001
2002	-0.028	0.221	-0.181	<0.001
2003	-0.028	0.205	-0.275	<0.001
2004	0.010	0.653	-0.204	<0.001
2005	-0.008	0.706	-0.229	<0.001
1976-1985	0.215		0.041	
1988-2006	-0.011		-0.218	

This table reports the Pearson correlation between *PTR* and *etr* and between *ROE* and *etr* for each year, along with the probability that the correlation is different from zero.

Variable Definitions:

ROE = After tax return on equity, measured as pre-tax income before special items less total tax expense divided by beginning of year owners' equity. Pretax income before special items equals data170 – data17, where data17 is set to zero if missing. Beginning of year owners' equity equals the prior year value of data60. Total tax expense is data16 less special items multiplied by *etr* before adjustments for special items. *ROE* is winsorized annually at the 1% and 99% levels.

PTR = Pre tax return, measured as pre-tax income before special items / beginning of year owners' equity. Pretax income before special items equals data170 – data17, where data17 is set to zero if missing.

Beginning of year owners' equity equals the prior year value of data60. *PTR* is winsorized annually at the 1% and 99% levels.

etr = Effective tax rate, measured as the total tax expense divided by pre-tax income before special items. ETR with values greater (less) than one (zero) are set to one (zero). Pretax income before special items equals data170 – data17, where data17 is set to zero if missing. Total tax expense is data16 less special items multiplied by *etr* before adjustments for special items.

TABLE 4
Tax Burden and Pre-Tax Returns, Controlling for Determinants of Tax Burden

Panel A - Descriptive Statistics of Regression Variables (n=55,261)

Variable	Mean	Lower Quartile	Median	Upper Quartile	Std Dev
<i>etr</i>	0.378	0.334	0.383	0.439	0.126
<i>Size</i>	5.287	3.925	5.129	6.506	1.839
<i>Lev</i>	0.167	0.031	0.146	0.261	0.147
<i>CAP</i>	0.303	0.154	0.264	0.411	0.200
<i>INV</i>	0.200	0.072	0.180	0.297	0.156
<i>RD</i>	0.022	0.000	0.000	0.024	0.044
<i>PTR</i>	0.278	0.147	0.243	0.360	0.189
<i>FOR</i>	0.071	0.000	0.000	0.057	0.151
<i>Post</i>	0.628	0.000	1.000	1.000	0.483

Panel B – Regression of *etr* on Pre-tax Returns controlling for other determinants (n=55,261)

$$\begin{aligned}
 &etr = \Pr e[\gamma_0 + \gamma_1 Size + \gamma_2 Lev + \gamma_3 CAP + \gamma_4 INV + \gamma_5 RD + \gamma_6 PTR + \gamma_7 FOR] \\
 &+ Post[\gamma_8 + \gamma_9 Size + \gamma_{10} Lev + \gamma_{11} CAP + \gamma_{12} INV + \gamma_{13} RD + \gamma_{14} PTR + \gamma_{15} FOR] + \varepsilon \quad (3)
 \end{aligned}$$

Independent Variable	Pre-TRA86 Estimate	t-value	Post-TRA86 Estimate	t-value	Difference	F-value
<i>Intercept</i>	0.405	73.10	-0.076	-11.76		
<i>Size</i>	0.001	0.68	-0.240	-10.08	-0.241	101.90
<i>Lev</i>	-0.077	-8.61	-0.113	-4.70	-0.035	1.87
<i>CAP</i>	-0.056	-6.62	-0.344	-5.38	-0.288	19.92
<i>INV</i>	0.070	8.81	0.006	9.82	-0.064	63.30
<i>RD</i>	-0.616	-15.45	0.053	7.68	0.668	274.93
<i>PTR</i>	0.102	23.00	-0.004	-0.88	-0.106	313.56
<i>FOR</i>	0.016	1.48	-0.001	-0.13	-0.017	1.73
R ²	0.095					
F (15, 9768)	346.2					
P-value	(<0.000)					

Equation (3) is estimated as a pooled cross-sectional regression with standard errors clustered by firm.

Variable Definitions:

- etr* = Effective tax rate, measured as the total tax expense divided by pre-tax income before special items. Effective tax rate with values greater (less) than one (zero) are set to one (zero). Pretax income before special items equals data170 – data17, where data17 is set to zero if missing. Total tax expense is data16 less special items multiplied by *etr* before adjustments for special items.
- Size* = Natural log of total assets.
- Lev* = Ratio of long-term debt to total assets.
- CAP* = Ratio of net property, plant, and equipment to total assets.

- INV* = Ratio of inventory to total assets.
- RD* = Ratio of R&D expense for the current year to sales for the current year. If R&D expense is missing, we set *RD* equal to zero.
- PTR* = Pre-tax return, measured as pre-tax income before special items / beginning of year owners' equity. Pretax income before special items equals data170 – data17, where data17 is set to zero if missing. Beginning of year owners' equity equals the prior year value of data60. *PTR* is winsorized annually at the 1% and 99% levels.
- FOR* = Ratio of foreign sales in the current year to total sales in the current year.
- Post* = Equal to one for years from 1988-2005, and zero otherwise.

Critical values for t-tests are 1.96 at the 0.05 level, 2.58 at the 0.01 level and 3.30 at the 0.001 level.

Critical values for F-tests are 3.84 at the 0.05 level, 6.64 at the 0.01 level and 10.84 at the 0.001 level.

TABLE 5
Descriptive Statistics of Firm Characteristics and Primary Analyses Variables

	Pre-TRA86 (1976-85) N=26,283		Post-TRA86 (1988-2005) N=44,024	
	Mean	Median	Mean	Median
t^*	0.452	0.449	0.368	0.364
λ^+	0.162	0.102	0.158	0.097
λ^-	-0.077	-0.051	-0.114	-0.056

Variable Definitions:

- t^* = Tax rate that would prevail if all firms in the sample had the same tax rate that year. Measured as the ratio of the sum of total tax expense (data16) adjusted for special items to the sum of pre-tax income before special items (data170 – data17) for all sample observations, calculated each year.
- λ^+, λ^- = Measure of a firm's tax preference or burden, measured as $\lambda = [(t^* - etr)/(1 - t^*)]$. λ^+ represents the positive values (preference) and λ^- represents the negative values (burden).

TABLE 6
Estimation of Extent of Implicit Taxes

$$ROE = \frac{[1 + \lambda (1 - \delta)]}{[1 + \bar{\lambda}_t(1 - \delta)]} ROE_t + \varepsilon \quad (11)$$

Year	δ Estimate	t value	p-value
1976	1.085	17.24	<.0001
1977	0.858	14.04	<.0001
1978	0.981	13.92	<.0001
1979	1.004	13.36	<.0001
1980	0.742	9.72	<.0001
1981	0.891	11.70	<.0001
1982	0.968	14.11	<.0001
1983	1.103	12.81	<.0001
1984	1.213	16.12	<.0001
1985	0.904	12.73	<.0001
1986	0.795	9.80	<.0001
1987	0.473	6.91	<.0001
1988	0.338	5.84	<.0001
1989	0.382	7.49	<.0001
1990	0.417	6.37	<.0001
1991	0.444	8.22	<.0001
1992	0.272	4.39	<.0001
1993	0.224	3.20	.0014
1994	0.313	4.85	<.0001
1995	0.239	4.46	<.0001
1996	0.133	3.61	.0003
1997	0.169	3.41	.0006
1998	0.157	3.51	.0004
1999	0.301	5.21	<.0001
2000	0.255	4.29	<.0001
2001	0.327	5.71	<.0001
2002	0.404	5.52	<.0001
2003	0.275	4.55	<.0001
2004	0.383	6.56	<.0001
2005	0.289	6.32	<.0001
1976-1985	0.975	21.52	
1988-2005	0.296	13.46	

TABLE 6 (continued)

We estimate equation (11) using maximum likelihood, with grid search parameters between zero and one in 0.05 increments.

The pre-TRA86 and post-TRA86 coefficients are the average coefficient estimates across the respective time periods and the t-statistics are derived from the standard errors of that distribution.

Variable Definitions:

- ROE = After tax return on equity, measured as pre-tax income before special items less total tax expense divided by beginning of year owners' equity. Pretax income before special items equals data170 – data17, where data17 is set to zero if missing. Beginning of year owners' equity equals the prior year value of data60. Total tax expense is data16 less special items multiplied by etr before adjustments for special items. ROE is winsorized annually at the 1% and 99% levels.
- \overline{ROE}_I = Long-term industry after-tax return on equity, measured as, the sum of pre-tax income before special items (data170 – data17) minus the sum of total tax expense (data16) adjusted for special items, scaled by the sum of beginning owners' equity (data60). We then average this value over the entire 30-year sample period by industry. This calculation is done for each Fama and French industry each year.
- λ = Measure of a firm's annual tax preference or burden, defined as $[(t^* - etr)/(1 - t^*)]$.
- etr = Effective tax rate, measured as the total tax expense divided by pre-tax income before special items. Effective tax rate with values greater (less) than one (zero) are set to one (zero). Pretax income before special items equals data170 – data17, where data17 is set to zero if missing. Total tax expense is data16 less special items multiplied by etr before adjustments for special items.
- t^* = Tax rate that would prevail if all firms in the sample had the same tax rate that year. Measured as the ratio of the sum of total tax expense (data16) adjusted for special items to the sum of pre-tax income before special items (data170 – data17) for all sample observations, calculated each year.
- $\overline{\lambda}_I$ = Measure of an industry's tax preference or burden. For each Fama and French industry each year, we calculate t^*_I (i.e. the industry ETR) as the industry sum total tax expense (data16) adjusted for special items divided by the industry sum of pre-tax income before special items (data170 – data17). Then, using t^*_I we calculate the industry tax preference, λ_I , each year, where $\lambda_I = (t^* - t^*_I)/(1 - t^*)$ and then average λ_I over the pre- and post-86 periods of the sample by industry.

TABLE 7
Results of Book-to-Market Ratio Analysis

Year	Low Tax Preference	High Tax Preference	Low-High Difference
1976	1.205	1.271	-0.066
1977	1.191	1.232	-0.040
1978	1.119	1.224	-0.106
1979	1.077	1.194	-0.117
1980	0.957	0.981	-0.024
1981	1.001	1.087	-0.087
1982	0.877	0.921	-0.044
1983	0.677	0.707	-0.030
1984	0.717	0.795	-0.077
1985	0.632	0.686	-0.055
1986	0.609	0.639	-0.029
1987	0.718	0.704	0.014
1988	0.695	0.672	0.024
1989	0.688	0.669	0.019
1990	0.873	0.812	0.060
1991	0.706	0.645	0.060
1992	0.679	0.599	0.079
1993	0.566	0.547	0.019
1994	0.608	0.603	0.005
1995	0.589	0.543	0.046
1996	0.558	0.531	0.027
1997	0.501	0.489	0.012
1998	0.636	0.626	0.010
1999	0.762	0.631	0.131
2000	0.917	0.742	0.175
2001	0.730	0.637	0.093
2002	0.853	0.706	0.147
2003	0.580	0.501	0.079
2004	0.506	0.465	0.041
2005	0.483	0.461	0.022
1976-1985	0.945	1.010	-0.065
1988-2005	0.663	0.604	0.058

We report the average ratio of book value of equity to market value of equity for observations in the lowest 40 percent of the λ distribution (low tax preference group) and the highest 40 percent of the λ distribution (high tax preference group) for the respective year and the difference between the two groups. The book-to-market ratio is winsorized at the 1% and 99% levels.

TABLE 8
*Results of Estimated Implicit Taxes and
Relative Firm Characteristics for High and Low Tax Preference Observations*

$$\hat{\delta}_t = \gamma_0 + \gamma_1 R_PTR_t + \gamma_2 R_Lev_t + \gamma_3 R_FOR_t + \gamma_4 R_RD_t + \gamma_5 R_SIZE_t + \varepsilon_t \quad (15)$$

Intercept	R_PTR	R_Lev	R_FOR	R_RD	R_SIZE	R²
2.846 (14.57)	-2.761 (-14.57)					0.829
-0.679 (-6.64)		1.227 (12.34)				0.839
1.002 (4.69)			-0.325 (-2.37)			0.146
1.365 (6.54)				-0.386 (-4.05)		0.369
-3.934 (-4.84)					4.321 (5.53)	0.505
1.589 (1.56)	-1.453 (-2.97)	0.727 (2.53)	-0.073 (-1.05)	0.034 (0.48)	-0.506 (-0.66)	0.864

Notes to table 8:

* All variables are winsorized at the 1% and 99% levels. For each ratio high (low) tax observations are in the top (bottom) 40 percent of the λ distribution where λ is a measure of a firm's annual tax preference or burden, defined as $[(t^* - etr)/(1 - t^*)]$.

Variable Definitions:

- etr* = Effective tax rate, measured as the total tax expense divided by pre-tax income before special items. Pretax income before special items equals data170 – data17, where data17 is set to zero if missing. Total tax expense is data16. Effective tax rate with values greater (less) than one (zero) are set to one (zero).
- $\hat{\delta}_t$ = The average annual estimate for δ from estimation of equation (11), reported in table 6
- t** = The ratio of the sum of total tax expense (data16) to the sum of pre-tax income before special items (data170 – data17) for all observations each year.
- R_PTR* = The ratio of the average *PTR* for low tax observations to the average for high tax observations, where *PTR* is pre-tax return measured as *PTI/OE* where *PTI* = data170 – data17, where data17 is set to zero if missing and *OE* = data60_{t-1}.
- R_Lev* = The ratio of the average *Lev* for low tax observations to the average for high tax observations, where *Lev* is the ratio of long-term debt to total assets
- R_FOR* = The ratio of the average *FOR* for low tax observations to the average for high tax observations, where *FOR* is the ratio of foreign sales to total sales, both in the current year
- R_RD* = The ratio of the average *RD* for low tax observations to the average for high tax observations, where *RD* is the ratio R&D expense to sales, both for the current year.
- R_SIZE* = The ratio of the average *SIZE* for low tax observations to the average for high tax observations, where *SIZE* is the natural log of total assets

APPENDIX

In this appendix, we replicate Wilkie (1992) for two samples and discuss two primary weaknesses of his method. First, we use a “restricted” sample that is based on our selection criteria with the additional requirement that firms have available data for all years in the pre-TRA86 period. This restricted sample has observations for 909 unique firms from 1976-85 distributed across 38 two-digit SIC codes.³⁹ Second, we use our broader, more representative sample of firms for the years in our study that overlap with Wilkie’s original study, 1976-85.

Wilkie (1992) defines a tax subsidy as “the difference between a firm’s current explicit tax liability and the tax due if: (1) pre-tax accounting income (PTI) is used as the tax base and (2) all income is taxed at the highest statutory rate (t)” (p. 99). On a pre-tax, rate of return basis, the tax subsidy of equity ($PTTSE$) is

$$PTTSE = \left[\frac{PTI(t) - CTAX\$}{OE} \right] \left[\frac{1}{1-t} \right] = \frac{PTR_w(t) - CTAX}{1-t} \quad (A1)$$

Following Wilkie (1992), we compute PTI as “the sum of income before extraordinary items and discontinued operations, minority interest, and income tax expense, less the firm’s equity earnings in unconsolidated subsidiaries” (page 101). $CTAX\$$ is current tax expense for the period. OE is computed as “the sum of common stockholders’ equity, preferred stock, and deferred taxes, less the firm’s investment in unconsolidated subsidiaries” (pages 101-102). Finally, PTR_w is PTI/OE and $CTAX$ is $CTAX\$/OE$.

Wilkie divides $PTTSE$ into permanent ($PTTSE_p$) and temporary ($PTTSE_T$) components

$$PTTSE = PTTSE_p + PTTSE_T$$

where

$$PTTSE_p = \frac{PTR_w(t) - TAX}{1-t} \quad (A2)$$

and

$$PTTSE_T = \frac{TAX - CTAX}{1-t} \quad (A3)$$

where TAX equals total tax expense for the year divided by OE .

We replicate Wilkie (1992) by estimating the regression in Table 9.

$$PTR_w = \theta_0 + \theta_1 PTTSE_p + \theta_2 PTTSE_T + \varepsilon \quad (A4)$$

where PTR_w , $PTTSE_p$ and $PTTSE_T$ are as defined above. The estimate for θ_1 , from (A4) is intended to capture the extent of implicit taxes related to the permanent tax subsidy measured as the difference between total taxes due and what would have been paid at the full statutory rate and is most analogous to our estimate of the extent of implicit taxes.

We present the regression results for the period 1976-1985, for both the restricted and unrestricted samples, in table A1, panels A and B. The results for our estimation are similar to those reported by Wilkie (1992). The average coefficient estimate for $PTTSE_p$ using our restricted sample is -0.727, compared with an average of -0.874 for Wilkie’s original analysis, and support his conclusion of

³⁹ Wilkie (1992) requires firm data from 1968-85 resulting in 818 unique firms. Our restricted sample is larger because of the shorter period over which we require firm data (ten years versus Wilkie’s 17 years). We also replicate Wilkie’s results using this longer period of survivorship with identical results.

the existence of implicit taxes. However, when we repeat the analysis for our full sample, we find that the evidence of implicit taxes is much weaker (table A1, panel B). The average coefficient estimate for $PTTSE_p$ falls from -0.727 for the restricted sample to -0.293 for the unrestricted sample, and indicates that Wilkie's estimate of the extent of implicit taxes during the period 1976 – 85 is sensitive to the sample composition.

We conjecture that the observed difference in results arises from two misspecifications of the model. First, in Wilkie's model, any increase in pretax return that is unrelated to taxes will affect both the left and right hand sides of equation (A4). In other words, because $PTTSE_p$ is a function of PTR , any shock to PTR will, by construction, also affect Wilkie's measure of tax preferences. Second, Wilkie's measure of tax subsidy is based on pretax income *after* the effects of implicit taxes, which would bias the coefficient estimates downward.

We directly address these two misspecifications in our model in the following ways. First, our estimate of tax preference does not rely on pretax returns, rather we use an industry ROE (ROE^*) measure averaged over the sample period. This substitution both minimizes the effect of any firm-specific shock to pretax returns and controls for variation across observations in risk. Second, we adjust our estimate of ROE^* to a before-tax preference measure by dividing by $[1 + \lambda(1 - \delta)]$, which represents the average industry tax preference after implicit taxes. This adjustment grosses up ROE^* to an estimate of the pre-implicit tax equilibrium returns.

To assess whether our model suffers from the biases in Wilkie's equation (A4), we estimate the extent of implicit taxes for the period 1976-85 for the restricted and unrestricted samples using our model given in equation (11). If our model is similarly misspecified, we would expect to see a decrease in the estimate of implicit taxes (δ) using the unrestricted sample relative to the restricted sample. Table A1, panel C presents the results.

We find that for both the restricted and unrestricted samples, our estimated coefficient reflects full implicit taxes (restricted sample: 1.253; unrestricted sample: 0.975). These estimates suggest that our model is not subject to the biases we identified in Wilkie's model. We note that the estimate for the restricted sample of 1.253 is above the expected value of one for complete implicit taxes and we attribute this to the difficulty of applying our model (which we developed for a broad sample of firms subject to implicit taxes) to a unique subset with unique characteristics related to the survivorship selection criteria. Regardless, it is clear that of the four estimates from these analyses (-0.727, -0.293, 1.253, and 0.975), only the estimate from the Wilkie model using the unrestricted sample does not indicate complete implicit taxes during this time period.

Table A1
 Wilkie Replication results for the Restricted and Unrestricted Samples

Panel A: Equation (A4) for the Restricted Sample

$$PTR_w = \theta_0 + \theta_1 PTTSE_P + \theta_2 PTTSE_T + \varepsilon \quad (A4)$$

Year	Intercept	t-stat	$PTTSE_P$	t-stat	$PTTSE_T$	t-stat	R^2
1976	0.286	68.33	-0.892	-7.23	0.173	1.79	0.054
1977	0.297	69.46	-0.857	-6.95	0.161	1.90	0.050
1978	0.304	71.08	-0.657	-5.61	0.136	1.56	0.033
1979	0.300	68.37	-1.210	-9.67	0.368	4.55	0.106
1980	0.278	64.16	-1.129	-9.63	0.185	2.48	0.098
1981	0.272	62.50	-0.912	-7.49	0.017	0.23	0.056
1982	0.221	47.60	-0.433	-3.37	0.422	5.81	0.042
1983	0.225	52.05	-0.559	-4.52	0.508	7.08	0.069
1984	0.244	53.94	-0.444	-4.10	0.290	4.24	0.040
1985	0.208	45.21	-0.183	-1.70	0.582	8.68	0.077
Average			-0.727		0.284		
Wilkie (1992) Table 9							
– average 1976-85			-0.874		0.121		

Panel B: Equation (A4) for the Unrestricted Sample

Year	Intercept	t-stat	$PTTSE_P$	t-stat	$PTTSE_T$	t-stat	R^2
1976	0.262	103.64	-0.660	-10.01	0.147	2.83	0.034
1977	0.264	97.82	-0.427	-6.80	0.201	4.10	0.020
1978	0.273	100.38	-0.301	-4.86	0.180	3.82	0.012
1979	0.272	94.07	-0.454	-6.73	0.330	6.70	0.030
1980	0.254	83.68	-0.327	-5.02	0.334	7.42	0.029
1981	0.239	79.45	-0.251	-3.78	0.277	6.69	0.020
1982	0.209	66.12	-0.258	-3.52	0.464	11.21	0.055
1983	0.207	69.39	0.011	0.15	0.426	10.16	0.039
1984	0.222	71.04	-0.140	-2.14	0.400	10.39	0.044
1985	0.201	64.09	-0.126	-1.84	0.528	13.01	0.069
Average			-0.293		0.329		
Wilkie (1992) Table 9							
– average 1976-85			-0.874		0.121		

Table A1 continued

Panel C: Equation (11) for the Restricted and Unrestricted Samples in the Pre-TRA86 period

$$ROE = \frac{[1 + \lambda (1 - \delta)] \overline{ROE}_t}{[1 + \overline{\lambda}_t (1 - \delta)]} + \varepsilon \quad (11)$$

Year	Restricted Sample			Unrestricted Sample		
	δ Estimate	t value	p-value	δ Estimate	t value	p-value
1976	1.200	8.86	<.0001	1.085	17.24	<.0001
1977	0.995	7.47	<.0001	0.858	14.04	<.0001
1978	1.178	9.02	<.0001	0.981	13.92	<.0001
1979	1.466	10.66	<.0001	1.004	13.36	<.0001
1980	1.504	14.37	<.0001	0.742	9.72	<.0001
1981	1.474	13.62	<.0001	0.891	11.70	<.0001
1982	1.228	12.99	<.0001	0.968	14.11	<.0001
1983	1.178	10.79	<.0001	1.103	12.81	<.0001
1984	1.202	14.73	<.0001	1.213	16.12	<.0001
1985	1.113	12.46	<.0001	0.904	12.73	<.0001
Average	1.253	23.3		0.975	22.69	

Notes to table A1:

All variables are winsorized at the 1% and 99% levels. We estimate equation (11) using maximum likelihood, with grid search parameters between zero and one in 0.05 increments.

The last two rows of panels A and B present the average coefficient estimate across the ten annual regressions and the standard error for that distribution, from the panel (first row) and from Wilkie's (1992) original results (second row). In panel C, the last row presents the average coefficient estimates across the ten years and the t-statistics are derived from the standard errors of that distribution.

Variable Definitions:

- PTR_w = Pre tax income / owners' equity. Measured as $[(DATA18 + DATA49 + DATA16 - DATA50) / (DATA60 + DATA130 + DATA35 - DATA31)]$.
- $PTTSE_p$ = (Pre tax income $\times t$) less total tax expense divided by owners' equity. This expression is then divided by $(1 - t)$. Where pre tax income is $(DATA18 + DATA49 + DATA16 - DATA50)$; t is the statutory tax expense; total tax expense is $DATA16$; and owners' equity is $(DATA60 + DATA130 + DATA35 - DATA31)$.
- $PTTSE_T$ = Deferred tax expense divided by owners' equity. This expression is then divided by $(1 - t)$. Where deferred tax expense is $DATA50$; owners' equity is $(DATA60 + DATA130 + DATA35 - DATA31)$; and t is the statutory tax rate.
- ROE = After tax return on equity, measured as pre-tax income before special items less total tax expense divided by beginning of year owners' equity. Pretax income before special items equals $data170 - data17$, where $data17$ is set to zero if missing. Beginning of year owners' equity equals the prior year value of $data60$. Total tax expense is $data16$.
- \overline{ROE}_t = Long-term industry after-tax return on equity, measured as, the sum of pre-tax income before special items ($data170 - data17$) minus the sum of total tax expense ($data16$), scaled by the sum of beginning owners' equity ($data60$). We then average this value over the entire ten-year sample period by industry. This calculation is done for each Fama and French industry each year for all

- observations in each sample under investigation.
- λ = Measure of a firm's annual tax preference or burden, defined as $[(t^* - etr)/(1 - t^*)]$.
- etr = Effective tax rate, measured as the total tax expense divided by pre-tax income before special items. Effective tax rate with values greater (less) than one (zero) are set to one (zero). Pretax income before special items equals data170 – data17, where data17 is set to zero if missing. Total tax expense is data16.
- t^* = Tax rate that would prevail if all firms in the sample had the same tax rate that year. Measured as the ratio of the sum of total tax expense (data16) to the sum of pre-tax income before special items (data170 – data17) for all observations in each sample under investigation, calculated each year.
- $\bar{\lambda}_I$ = Measure of an industry's tax preference or burden. For each Fama and French industry each year, we calculate t^*_I (i.e. the industry ETR) as the industry sum total tax expense (data16) divided by the industry sum of pre-tax income before special items (data170 – data17). Then, using t^*_I we calculate the industry tax preference, λ_I , each year, where $\lambda_I = (t^* - t^*_I)/(1 - t^*)$ and then average λ_I over the ten-year period of the sample under investigation by industry.