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THE DIVERGENCE BETWEEN BOOK INCOME AND TAX INCOME

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EXECUTIVE SUMMARY

This paper examines the evolution of the corporate profit base and the relationship between book income and tax income for U.S. corporations over the last two decades. The paper demonstrates that this relationship has broken down over the 1990s, and it has broken down in a manner consistent with increased tax-sheltering activity. The paper traces the growing discrepancy between book income and tax income associated with differential treatments of depreciation, the reporting of foreign source income, and in particular the changing nature of employee compensation. For the largest public companies, proceeds from option exercises equaled 27 percent of operating cash flow from 1996 to 2000. These deductions appear to be fully utilized, thereby creating the largest distinction between book income and tax income. While the differential treatment of these items has historically accounted fully for the discrepancy between book income and tax income, this paper demonstrates that book and tax income have diverged markedly for reasons not associated with these items during the late 1990s. In 1998, more than half the difference

between tax and book income—approximately $154.4 billion, or 33.7 percent of tax income—cannot be accounted for by these factors. This paper proceeds to develop and test a model of costly tax sheltering and demonstrates that the breakdown in the relationship between tax income and book income is consistent with increasing levels of sheltering during the late 1990s. These tests also explore an alternative explanation of these results—coincident increased levels of earnings management—and find that the nature of the breakdown between book and tax income cannot be explained fully by this alternative explanation.

1. INTRODUCTION

Recent trends in the corporate profit base, and the tax revenues it generates, have drawn considerable attention. In particular, the gap between book income and tax income has reportedly widened over the last decade, and corporate tax receipts have been lower than expected. Seen against the backdrop of a protracted economic expansion over the 1990s, these trends have generated considerable concern over the proliferation of tax-sheltering activity by corporations. These concerns have been amplified further by anecdotal evidence on the proliferation of these schemes and by high-profile cases associated with large corporations. Estimates of tax-sheltering activity have ranged widely, depending on the source and methodology employed in generating those estimates.[1]

The focus on corporate tax shelters raises several new questions related to the integrity of the corporate tax base. In particular, financial innovations that reduce the costs of, and widen the scope for, recharacterizing income may lead to difficulties in maintaining the corporate tax base. Similarly, the increased importance of legitimate foreign operations for U.S. firms, the attendant transfer-pricing opportunities afforded by such operations, and increased competition by jurisdictions for those investments may increase the scope for income shifting. In short, U.S. firms are faced with enhanced opportunities for avoiding or evading corporate taxes through cheaper, more sophisticated, and less transparent mechanisms.

These questions and concerns over the viability of the corporate tax base and the scope of sheltering activity have given rise to varied legislative proposals but limited empirical analysis of the claims associated with increased tax-sheltering activity. Additionally, evidence on sheltering ac-

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[1] The concerns regarding the scope and increased incidence of tax shelters can be found in various sources, including Bankman (1999), Sullivan (1999a, 1999b, 2000a) and U.S. Treasury (1999). Talisman (1999) and Kies (1999a, 1999b, 1999c, and 2000) provide alternative interpretations of these trends. For a perspective on the variety of instruments associated with sheltering activity, see U.S. Treasury (1999).

tivity that comes from reported book income and tax income raises the issue of other differences that might arise between book and tax income and their growing incidence or magnitude. Thus, empirical explorations of the nature of sheltering activity must jointly investigate the changing nature of book and tax income to identify any underlying trends in the gaps that separate them.[2]

This paper attempts to illuminate recent trends in the corporate profit base to highlight the possible aggregate scope of sheltering activity, the other determinants of the gaps between book and tax income and their scope for explaining recent trends, and the dynamics of the relationship between tax and book income over the last decade. The evidence provided in this paper demonstrates that the link between book and tax income has broken down over the last decade for two reasons. First, the identifiable factors that have been associated traditionally with the distinction between book and tax income have grown tremendously. In addition to the growing relevance of overseas operations and the different measures of depreciation, the paper explores the proliferation of employee stock options (ESOs) and quantifies their impact on the corporate profit base. From 1996 to 2000, net proceeds from the exercise of ESOs for the largest U.S. corporations approximated 27 percent of operating cash flows. These net proceeds appear to be utilized nearly fully as deductions against pre-tax income for the corporations studied.

Second, the breakdown between tax income and book income is not limited to the growth of these traditional distinctions between tax and book income. While the distinctive treatment of these items has historically accounted fully for the difference between book and tax income, the paper demonstrates that book and tax income have diverged markedly for reasons not associated with these items during the late 1990s. In 1998, more than half of the difference between tax and book income—approximately $154.4 billion, or 33.7 percent of tax income—cannot be accounted for by these historically relevant measures of the discrepancy between tax and book income.

To identify the reasons for this breakdown, the paper develops a model of tax sheltering and then tests that model by exploring the dynamic of

[2] The difficulties in isolating these activities precisely should not be understated. After surveying varied and conflicting estimates of the nature of sheltering activity, Joint Committee on Taxation (2000) states, "[T]he Joint Committee staff believes that direct measurement of corporate tax shelter activity through macroeconomic data is not possible. Instead, a more instructive approach may be to analyze specific tax shelter transactions that have come to light and evaluate their effect on corporate receipts" (p. 16). While not disagreeing with this approach, I attempt in this paper at least to uncover evidence of the underlying trend in sheltering activity and some evidence of the overall scope at the macroeconomic level to inform the debate.

the link between tax income and book income over time and by levels of tax income. The estimates motivated by this model of sheltering provide evidence that the patterns of the deteriorating link between tax and book income are consistent with increased levels of sheltering over the decade. One important alternative hypothesis—that the breakdown of the link between tax income and book income reflects coincident increased levels of earnings management—is also investigated. Measures associated traditionally with different levels of, or motives for, earnings management do not appear to explain fully the distinctive nature of the breakdown of the link between tax and book income in the latter part of the decade. Taken together, the evidence suggests that the large, unexplained gaps between tax and book income that have arisen during the late 1990s are at least partly associated with increased sheltering activity.

Section 2 reviews alternative methodologies for understanding the dynamics of corporate profits and their relative merits and recent findings. Section 3 examines the changing relationship between tax income and book income as viewed through the lens of aggregated data generated from tax forms where firms reconcile tax and book income. Section 4 reviews in detail the changing nature of employee compensation and its impact on the corporate profit base by exploiting several different sources of data on option exercises. Section 5 of the paper develops a model of tax-sheltering activity and then tests that model through analyses of book and tax income generated from accounting statements over the 1990s, with special attention paid to the alternative explanation of earnings management. Section 6 presents the conclusion.

2. PREVIOUS WORK AND REVIEW OF ALTERNATIVE METHODOLOGIES

Efforts to understand the dynamics of corporate profits and tax revenues typically rely on three distinct sources: (1) economy-wide aggregate data taken from national income accounts, (2) reported tax and book income from tax forms, and (3) reported book income and simulated tax income from accounting statements. Each of these sources has distinct advantages and disadvantages in understanding the scope of tax-sheltering activity and, unsurprisingly, each yields different conclusions. These distinct sources and methodologies also provide much confusion about their conflicting implications.

National income accounts provide the most aggregate picture of corporate profitability and allow for a disentangling of the different reasons why average tax rates depart from statutory rates. By implementing the

procedure proposed in Auerbach and Poterba (1987), Mackie (2000) provides this perspective on recent corporate profitability and the implications for recent tax collections. He documents a reduced average tax rate amid rising corporate profitability and traces several rationales for this phenomenon. Mackie concludes that this aggregate perspective cannot illuminate the nature of tax-sheltering activity as the basic income measure employed prevents any corresponding measure of what income would have been in the absence of sheltering activity. In other words, typical shelters reduce both income and taxes, leaving average tax rates unaffected.[3]

To understand the scope of sheltering activity, the joint reporting of book income and tax income affords the promise of measuring activity reported to shareholders but not reported to tax authorities. Indeed, much of the recent concern over tax shelters reflects the use of Treasury data to construct comparisons between tax income and book income as reported in Schedule M-1. The joint reporting of book income and tax income by firms in their tax forms affords the possibility of analyzing the gap between the two notions of income and the varied determinants of that gap. The reconciliation between book and tax income in Schedule M-1 is of limited detail and, consequently, parsing out alternative explanations of the gap is difficult. Finally, the use of the micro data is limited given accessibility and confidentiality requirements imposed by the IRS.[4] Nonetheless, the aggregate perspective afforded by this reporting, along with the ability to analyze true tax income as opposed to simulated tax income, makes this a valuable source.

Accounting statements can also be used to generate comparisons between book income and simulated tax income. In particular, there is an extensive literature gauging the reliability of alternative estimates of tax income generated from accounting statements by explicitly comparing them to IRS data on tax income.[5] These studies then typically go on to study the differences between book and tax income, as generated by the accounting statements, to study the nature of permanent and temporary

[3] For a related effort, see Petrick (2001) for a comparison on NIPA profits with S&P 500 profits, and a discussion of the compositional reasons why these measures may differ.

[4] Plesko (2002) provides a detailed reconciliation for 1996–1998. Using a distinct measure of pretax book income and tax net income from Talisman (1999) and the one employed in this paper, he finds that the difference between pretax book income and tax net income grew by 71.9 percent between 1996 and 1998. His measure of the aggregate difference between pretax book and tax income as reported by firms is $159 billion in 1998.

[5] See Plesko (2000, 2003) and Mills and Newberry (2001) for a discussion of these alternative measures and their relative merits.

differences in tax accounting. These estimates of book and simulated tax income can also be employed to infer something about tax-sheltering activity, as in Manzon and Plesko (2001). Manzon and Plesko (2001) study the gap between accounting-based definitions of tax income and book income, and demonstrate that a few measures approximating the demand for tax shelters help explain the cross-sectional variation in these gaps.[6]

As noted by Hanlon and Shevlin (2001), the estimates of book and tax income generated by accounting statements do not encompass the same differences as those generated by viewing differences between book and tax income as reported on tax forms. In particular, deductions associated with the exercise of stock options will not be represented in the gap between book and tax income generated from accounting statements but will show up in the gap generated using tax forms.[7] In addition to this distinction in the reporting of deductions associated with option exercises, any analysis of book income must address potential managerial motives to manage earnings. Many authors have contributed to the literature that tries to define, document, and understand the motivation behind earnings management.[8] While the magnitude and impact of such behavior remains in question, it is conceivable that trends in earnings management could result in systematic variation in book and tax income.

The analysis that follows attempts to use the IRS and accounting sources of tax and book income to illuminate the problem of tax shelters. The aggregate view, as represented by IRS data, is analyzed in section 3 in tandem with an exploration of the impact of ESOs in section 4. The disaggregated view generated by accounting statements is analyzed in section 5 by developing a model of tax sheltering and then testing it. This analysis also discusses the possibility that earnings management might result in similar empirical patterns and tries to distinguish sheltering activity from earnings management.

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[6] Manzon and Plesko (2001) relate the absolute magnitude of the gap to possible determinants of demand for sheltering activity. They find that dummy variables associated with the presence of pretax profits and net operating losses help predict the size of the gap in a cross-sectional regression.

[7] This difference results from the departure from "clean surplus" accounting in the accounting of stock options. In short, tax benefits from exercise of ESOs do not flow through the income statement but are simply transferred to additional paid-in capital. As a consequence, tax expenses from accounting statements won't allow for consideration of the deductions associated with exercises. The reporting of these tax benefits associated with employee exercises is continuing to evolve, and Hanlon and Shevlin (2001) argue that varied estimates of tax rates make the mistake of inferring tax rates without consideration for the effects of these tax benefits.

[8] See Dechow and Skinner (2000), Healy and Wahlen (1999), and Schipper (1989) for review articles of this literature.

3. TAX INCOME, SIMULATED BOOK INCOME, AND ACTUAL BOOK INCOME

Concerns over increased sheltering activities by corporations are typically associated with trends in corporate tax receipts and trends in the gap between tax income and book income employing figures extracted from tax returns. Figure 1 considers the ratio of federal corporate tax receipts to all federal on-budget tax receipts from 1971 to 2001, as reported in Office of Management and Budget (2002). The figure depicts the overall decline in that ratio, from nearly 19.7 percent in 1977 to 10.2 percent in 2001. Much of the pattern in this ratio for the intervening years can be explained by large legislative changes and general economic conditions. The recent decline, beginning in 1996, is more puzzling given the coincident economic expansion. In particular, this ratio falls from 15.8 percent in 1996 to 13.5 percent in 2000 and then, even more dramatically, to 10.2 percent in 2001.

The relationship between tax and book income as reported in Schedule M-1 demonstrates a similarly curious trend. These figures have been employed by the Treasury Department to emphasize the increased incidence and magnitude of corporate tax shelter activity. Figure 2 reproduces a figure from Talisman (1999) that is also related to the figure employed in the Treasury Department's study of corporate tax shelters (U.S. Treasury,

FIGURE 1. *Corporate Tax Receipts as Percentage of Total On-Budget Receipts, 1971–2001*
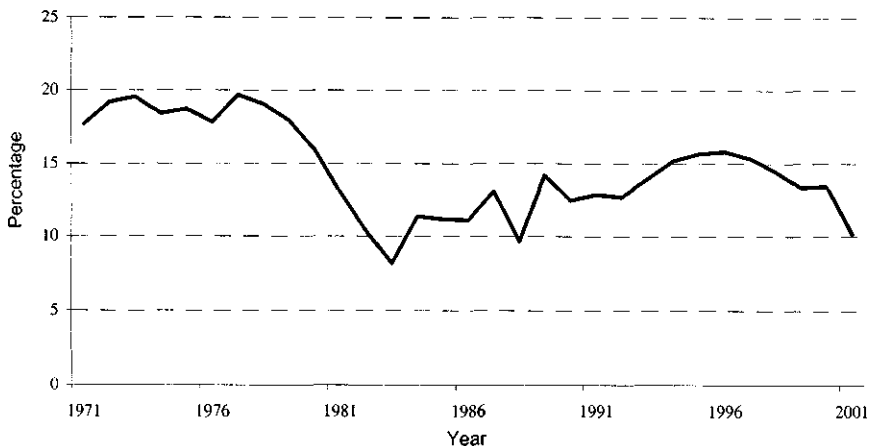
The graph shows the ratio of corporate tax receipts to all on-budget federal receipts, as reported in Office of Management and Budget (2002).

FIGURE 2. *Actual Book and Tax Income, Firms with Greater Than $1 Billion in Assets, 1991–1996*

Billions of 1992 dollars

450 400 350 300 250 200 150 100 50 0

1991 1992 1993 1994 1995 1996

Year

Book income

Tax income

	1991	1992	1993	1994	1995	1996
Inferred multiple of book over tax income	1.13x	0.94x	1.15x	1.39x	1.26x	1.40x
Inferred excess of book over tax income	20.0	(10.0)	30.0	85.0	70.0	120.0
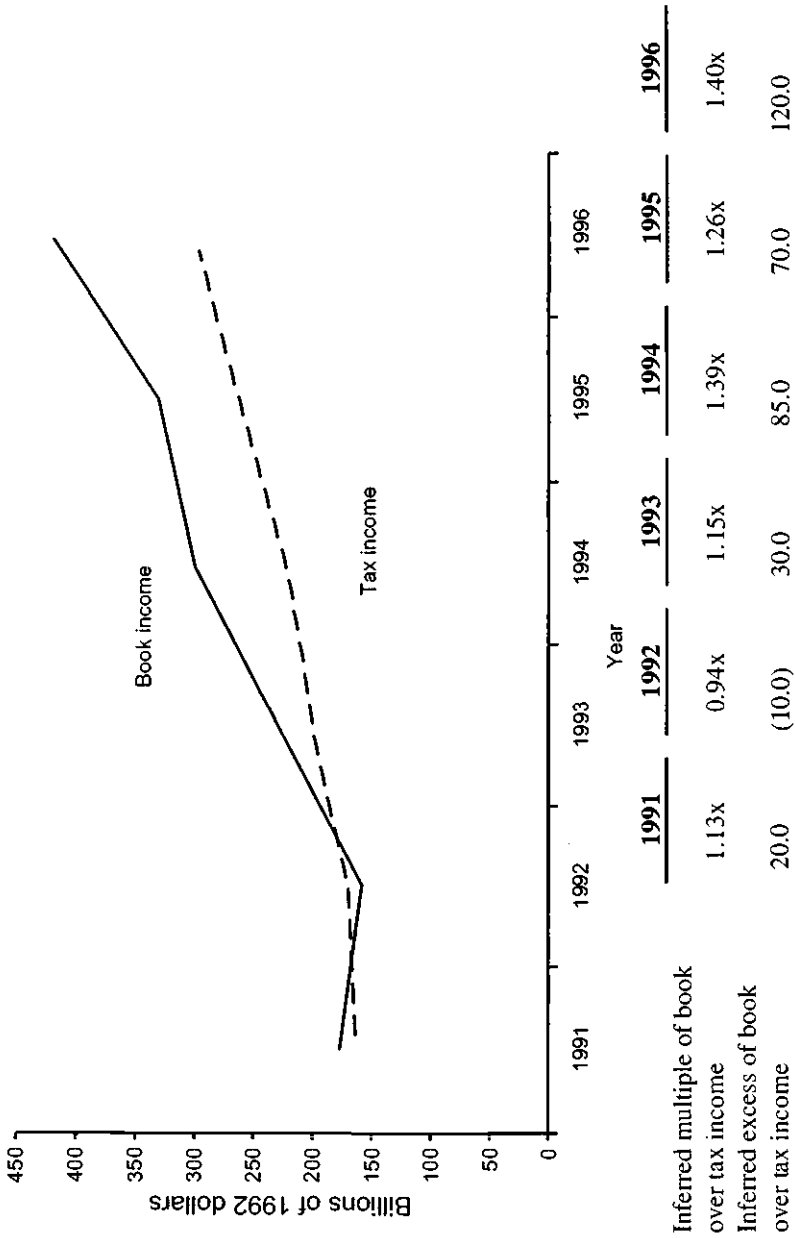
The graph is extracted from Talisman (1999). Book income corresponds to after-tax book income from Schedule M-1 plus federal taxes less tax-exempt interest. Tax income is the difference between total receipts and total deductions. This graph is based on all corporations with assets greater than $1 billion and excludes S-corporations, RICs, REITs, and foreign corporations.

1999). This graph employs data for only those corporations with assets greater than $1 billion. Inferring a multiple of book income over tax income from that graph illustrates the concern that tax-sheltering activity has increased over that period. In particular, the ratio of book income to tax income grows to 1.4 from 1.0 over five years. Alternatively, book income exceeds tax income by approximately $120 billion (in 1992 dollars) by 1996. This figure, and the gap it highlights, has served as the most important source of data for the debate on corporate tax shelters. As pointed out by Kies (1999a), however, there are several alternative explanations for this gap that make such a picture inconclusive.

To understand the implication of this widening gap for the scope of tax-sheltering activity, it is useful to construct a measure of simulated book income that incorporates identifiable sources of that gap. In particular, discrepancies between tax and book income may be attributable to causes unrelated to tax-sheltering activity. The evidence in Table 1 and Figure 3 considers the dynamics of tax and book income for firms that have assets greater than $250 million and isolates the impact stemming from three potential sources of that gap: (1) the differential treatment of depreciation expense on tax and book forms, (2) reinvested earnings abroad, and (3) deductions associated with the exercise of nonqualified stock options. Before analyzing the data, the distinctions between the two sets of data should be emphasized. Figure 2 employs actual tax return data from 1991 to 1996 to analyze the gap between actual tax and book income for corporations that have more than $1 billion in assets and are not S-corporations, RICs, or REITs. In contrast, Table 1 and Figure 3 initially simulate that gap for similar corporations, but with a cutoff of $250 million in assets over the period from 1982 to 2000.

Table 1 provides data, in current dollars, for simulating book income for these corporations and begins with an estimate of tax income comparable to the base in the Talisman figure. To analyze the impact of the discrepancy between depreciation expense allowed for tax purposes and that associated with book accounting, Table 1 draws on Bureau of Economic Analysis (BEA) estimates of the capital consumption allowance (CCA) adjustment, which measures the discrepancy between tax measures of depreciation and economic depreciation. This aggregate measure of the discrepancy is scaled by that fraction of depreciation expenses for firms with over $250 million in assets. To the degree that economic depreciation is not representative of depreciation associated with historic cost accounting, and to the degree that this link between accounting and economic depreciation has become more tenuous over time given the changing nature of assets, the evidence in Table 1 likely understates the impact associated with gaps between tax and accounting notions of depreciation.

TABLE 1

Tax Income and Components of Simulated Book Income, 1982–2000*

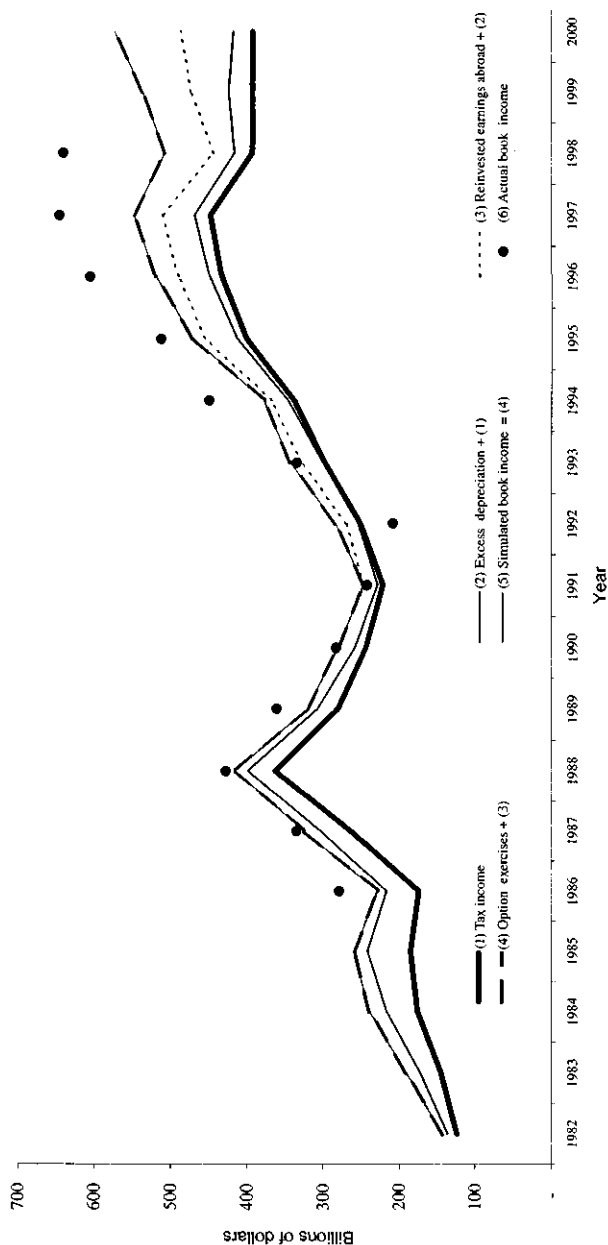| Year	Tax income	Excess depreciation	Reinvested earnings abroad	Proceeds from option exercises	Simulated book income
1982	85,223	8,437	4,574	N/A	98,234
1983	103,103	19,340	13,107	N/A	135,550
1984	130,569	30,276	16,803	N/A	177,649
1985	142,224	43,557	13,397	N/A	199,179
1986	136,194	33,457	9,247	N/A	178,899
1987	214,618	31,915	17,687	N/A	264,220
1988	306,665	30,341	13,447	N/A	350,453
1989	248,551	23,759	11,775	N/A	284,085
1990	227,723	13,542	20,488	N/A	261,753
1991	215,572	7,031	17,568	N/A	240,171
1992	251,587	3,014	15,733	14,086	284,419
1993	307,302	2,866	29,212	15,365	354,744
1994	357,936	8,545	23,342	10,416	400,240
1995	436,533	13,095	45,708	17,649	512,985
1996	485,645	17,427	46,035	32,412	581,519
1997	513,332	23,660	47,728	42,626	627,346
1998	457,575	27,356	31,620	73,598	590,150
1999	457,575	37,218	58,806	74,832	628,431
2000	457,575	31,243	84,111	106,265	679,195

* All dollar figures are in current dollars. Tax income is total receipts less total deductions for firms with greater than $250 million in assets, excluding RICs, REITs, and S-corporations. The tax income figures for 1999 and 2000 are not available, so the simulated book income figure assumes that tax income stays at 1998 levels. Excess depreciation corresponds to the CCA adjustment scaled for the relative use of depreciation by firms with greater than $250 million in assets. Reinvested earnings abroad are the difference between foreign earnings and repatriations scaled for the relative levels of foreign income for firms with greater than $250 million in assets. Option exercises are the proceeds from exercises, as more fully reported in Table 2. Simulated book income is the sum of those figures.

Similarly, Table 1 captures the discrepancy between income earned by U.S. corporations operating abroad and the income that is repatriated from BEA data on capital flows.[9] Finally, Table 1 provides data from Execucomp on the aggregate level of option exercises by employees, which is discussed in greater detail below. These data are available only for years subsequent to 1992. Tax income from 1999 and 2000 is not yet available but is presumed to stay at 1998 levels to facilitate a baseline comparison for 1999 and 2000.

Figure 3 relates the findings of Table 1 in a format comparable to the evidence provided in Figure 2 by translating the figures from Table 1

[9] These figures are scaled by the annual fraction of foreign tax credits attributable to firms with assets more than $250 million.

FIGURE 3. *Tax Income, Simulated Book Income, and Actual Book Income for Firms with Greater Than $250 Million in Assets, 1982–2000*

	1986	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
Actual BI / Actual TI	1.60x	1.27x	1.18x	1.28x	1.16x	1.09x	0.83x	1.12x	1.33x	1.28x	1.40x	1.44x	1.63x
Actual BI - Actual TI	105	70	65	80	39	21	(42)	37	111	111	172	197	247
Actual BI / Simulated BI	1.22x	1.03x	1.03x	1.12x	1.01x	0.98x	0.74x	0.97x	1.19x	1.09x	1.17x	1.18x	1.26x
Actual BI - Simulated BI	51	9	13	40	2	(5)	(75)	(9)	71	41	86	97	133

Tax income corresponds to total receipts less total deductions for filers with more than $250 million in assets, excluding RICs, REITs, and S-corporations. Excess depreciation corresponds to the difference in tax and economic depreciation as outlined in CCA adjustments. Reinvested earnings abroad is the difference between earnings abroad and repatriated earnings, as reported by the BEA. Option exercises are estimated from Execucomp data and are available only from 1992 onward. Simulated book income is the sum of those items. Black dots correspond to actual book income for those same companies and represent after-tax book income from Schedule M-1 plus federal taxes less tax-exempt interest. Figures are in 1992 dollars. For 1989, IRS data is available only for all filers. The greater-than-$250-million category is interpolated by assuming that the ratio for this category relative to all filers is the average of those ratios in 1988 and 1990. The bottom four rows compare actual book income to actual tax income and actual book income to simulated book income.

into 1992 dollars. The bottom line in Figure 3 presents tax income, and each line above it adds an identifiable source of the difference between tax income and book income so that the uppermost line represents simulated book income. The evidence provided in Figure 3 indicates several important features of the changing nature of the relationship between book income and tax income. First, while gaps between tax income and book income were associated with differing notions of depreciation during the 1980s, the role of depreciation differences is now considerably smaller. Nonetheless, recent years feature a renewed distinction between tax and economic notions of depreciation that maps to the tax income and book income gap. Second, reinvested earnings abroad, which may reflect both increased foreign activity as well as changed repatriation patterns, are growing in importance and are contributing significantly toward a larger gap.[10] Finally, differing treatment of exercises of ESOs now provides the largest component of the growing gap between tax and simulated book income. By 1998, these three sources comprised 29.0 percent of tax income. The divergence of simulated book income and tax income through the last decade appears to be growing particularly rapidly near the end of the decade. While precisely comparable ratios are not yet available for 1999 and 2000 (because tax income is not available), it is clear that these discrepancies—particularly option exercises and reinvested earnings abroad—have grown even more rapidly after 1998.

While this comparison between tax income and simulated book income suggests that these two series have become increasingly distinct during the 1990s for identifiable reasons, it is even more striking how *actual* book income relates to reported tax income and simulated book income. Figure 3 plots—with dots—actual book income from 1986 to 1998 for this same set of firms.[11] From 1986 to 1993, actual book income tracks simulated book income remarkably well, with the exception of 1992, when actual book income dips below both simulated book income and tax income. Beginning in 1994, however, actual book income begins to diverge rapidly from both tax income and simulated book income. This divergence is most acute in 1998, when tax income falls by 10.9 percent, simulated book income falls by 5.9 percent, and actual book income rises by 0.8 percent. By

[10] These changed patterns of repatriation may themselves reflect increased levels of the relocation of income in response to tax incentives. For a recent study of repatriation patterns and their responsiveness to tax incentives, see Desai, Foley, and Hines (2001). For the use of changed ownership forms in response to international tax incentives, see Desai, Foley, and Hines (2003) on indirect ownership of foreign affiliates and Desai and Hines (2002) on expatriations.

[11] This series was provided by the IRS. Figures for 1989 are available only for all firms, so the amounts associated with filers with more than $250 million in assets is interpolated from similar ratios for 1988 and 1990.

1998, this divergence results in actual book income being 1.63 times tax income and 1.26 times simulated book income. Indeed, in 1998, more than half of the difference between tax income and actual book income—approximately $154.4 billion, or 33.7 percent of tax income—cannot be accounted for by these sources of the distinction between tax income and book income.

This breakdown between both actual book income and tax income and between actual book income and simulated book income can have several alternative explanations. First, the identified sources of differences between tax income and book income that have been estimated—particularly the scope of option exercises—could be understated in Figure 3 and Table 1, and these sources could account for an even larger fraction of the difference between tax income and actual book income. The following section investigates the actual scope of option exercises in more detail to consider this possibility. Second, alternative discrepancies between book income and tax income, such as the proliferation of hybrid instruments that provide for deductions to tax income but not book income or the differential treatment of pension earnings, could account for some fraction of the gap. Aggregate estimates of such activity suggest that these sources are not likely to be large enough to comprise significant fractions of the unexplained difference between book income and tax income.[12]

Third, earnings management, either through the intertemporal shifting of income or through fraudulent book reporting, could be associated with this gap. This possibility is investigated further in section 5, but it is worth noting the distinction in the beliefs of practitioners and researchers on the scope of earnings management. In particular, Dechow and Skinner (2000) note, "[W]hile practitioners and regulators seem to believe that earnings management is both pervasive and problematic, academic research has not demonstrated that earnings management has a large effect on average

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[12] For example, Engel, Erickson, and Maydew (1999) study a sample of all trust preferred stock issued between 1993 and 1996 that amounts to $36 billion of issuances. A current query of the Securities Data Corporation database for all securities classified as MIPS, TOPRS, TRUPS, TRACES, or trust preferred of any kind, provides for $73 billion of issuance from 1993 to 2001. Only the periodic payments of these instruments would be associated with the gap between book income and tax income, so it seems unlikely that such debt-equity hybrid instruments can account for meaningful fractions of the unexplained difference. As publicized widely in the press, Adams (2001) reports that for 30 percent of S&P 500 companies, pension earnings comprise an average of 12 percent of pretax income in 2000. Such a figure, if true for *all* companies, would begin to account for a more significant portion of the gap. For example, in 1998, such a ratio could account for 57 percent of the unexplained difference. Firms that report such a figure, and on which such an average ratio is based, are biased toward having material amounts to report, and many firms do not have defined benefit plans that give rise to these differences, so such an extrapolation provides an extreme upper bound on the potential for pension accounting to contribute to this difference.

TABLE 2
Estimates of Option Grants and Exercises, 1992–2000 (Execucomp)*

| Year | Number of firms | To top five executives | | | To all employees | |
		Grant value ($)	Exercises ($)	Median share of all exercises (%)	Grant value ($)	Exercises ($)
1992	1,442	$ 1,510	$ 2,416	24.1%	8,713	14,086
1993	1,591	2,407	2,341	26.7	12,915	15,365
1994	1,646	3,494	1,892	28.5	17,892	10,416
1995	1,727	3,646	2,655	27.5	20,280	17,649
1996	1,865	6,010	4,257	27.6	32,286	32,412
1997	1,920	8,382	6,718	27.1	47,015	42,626
1998	1,910	9,620	9,421	24.9	79,555	73,598
1999	1,765	13,768	10,413	25.7	123,113	74,832
2000	1,435	16,430	14,628	23.5	199,085	106,265

* The data presented in this table are taken for the full universe of firms reported in the Execucomp database. Grant values represent the dollar value using the Black-Scholes valuation model of option grants; exercises represent the excess of the market value of shares exercised over the proceeds from exercised options; the median share of all of a company's options (based on shares granted) accounted for by the top five executives is the ratio of grants to the top five executives over grants to all employees. Grant values for all employees are determined by grossing up the value of grants to the top five executives by a company's share of options granted to the top five executives; exercises for all employees are estimated by grossing up exercises of the top five executives by the average across all years of the median share of all exercises, unless the average is less than 1%. Then exercises are grossed up using 20%.

on reported earnings, or that whatever earnings management does exist should concern investors." Finally, in contrast to an earnings management explanation that emphasizes the inflation of book earnings, this gap could reflect the artificial underreporting of tax income relative to book income. This hypothesis is investigated through the model developed in section 5.

4. CHANGING TRENDS IN EMPLOYEE COMPENSATION AND THE CORPORATE TAX BASE

The large and growing importance of option exercises as a reason that the corporate tax base is shrinking is explored further in Tables 2, 3, and 4. Various studies have considered the incentive and behaviorial consequences of options as a form of compensation.[13] Few, however, have considered the consequences associated with the proliferation of option

[13] See Murphy (1999) for an overview or Core and Guay (2001) and Huddart and Lang (1996) for a detailed study of exercise behavior.

TABLE 3
Estimates of Option Exercises, 1996–2000 (SEC Filings)*

Item	2000	1999	1998	1997	1996	Cumulative 1996–2000
Number of companies	145	142	139	113	109	145
Median option exercises (millions of dollars)	147	149	135	96	52	592
Mean option exercises (millions of dollars)	543	525	362	238	132	1,684
Aggregate option exercises (millions of dollars)	78,779	74,539	50,376	26,909	14,398	244,151
Median ratio of option exercises to operating cash flow	7.9%	7.7%	10.0%	6.8%	4.8%	9.0%
Mean ratio of option exercises to operating cash flow	29.1%	22.6%	19.6%	12.7%	9.8%	27.2%

* This table presents data compiled from SEC filings for the universe of companies with the largest market capitalization, as detailed in appendix table 1 of Desai (2002). Median, mean, and aggregate values of option exercises are calculated as the excess of market value over the average strike price, where the volume-weighted average price in a given year is used to establish market values. The median and mean ratio of option exercises to operating cash flow scales estimated annual option exercises by operating cash flows, or net income in the case of financial institutions. The underlying data for this table are provided in appendix table 1, and the methodology is more fully described in the data appendix, of Desai (2002).

instruments for the corporate tax base.[14] Tax-related studies (e.g., Hall and Liebman, 2000; Goolsbee, 2000a, 2000b) have emphasized the behavior of top executives rather than the impact of these changed compensation instruments on the corporate profit base.

Table 2 provides an overview of option-granting and exercise behavior for nearly 2,000 firms, from 1992 to 2000, from the Execucomp database.[15]

[14] Sullivan (2000b), Bear Stearns (2000), and McIntyre (2000) are exceptions. Each considers a subsample of up to forty firms in an effort to gauge the overall impact of option exercises on the corporate tax base.

[15] The Execucomp database contains information on various types of compensation for top executives in companies, including options granted and exercised to each executive and the percentage these represent of all options granted and exercised, respectively, by all employees of each company, each year. These data are presented by executive and by company, with up to five records (one for each executive) for each company, for each year. From these individual executive / company / year records, it is possible to calculate aggregate grants and exercises for the top five executives.

TABLE 4

Reported Tax Benefits and Estimated Option Exercises, 1998–2000 (SEC Filings)*

Rank	MV rank	Company name	2000 option exercises / OCF	2000		1999		1998	
				Tax benefits from option exercises	Option exercises	Tax benefits from option exercises	Option exercises	Tax benefits from option exercises	Option exercises
1	97	Lucent Technologies	668%	1,064	2,030	394	1,542	287	1,143
2	131	eBay	272%	37	273	11	229	0	849
3	145	Immunex	254%	N/A	437	N/A	135	N/A	16
4	77	Genentech	245%	226	475	83	310	17	N/A
5	147	Forest Laboratories	160%	80	289	24	44	17	53
6	29	Oracle	158%	N/A	3,437	N/A	710	N/A	144
7	128	Maxim Integrated	138%	239	667	155	488	137	254
8	12	AOL–Time Warner	115%	N/A	2,247	N/A	7,271	N/A	1,898
9	15	Cisco Systems	113%	1,397	6,940	2,495	4,478	837	2,340
10	35	Amgen	92%	377	1,505	152	725	108	372
11	78	EMC	81%	208	1,716	58	565	44	228
12	109	Charles Schwab	80%	N/A	578	N/A	713	N/A	198
13	33	Dell Computer	79%	929	3,314	1,040	3,093	444	2,407
14	73	Applied Materials	77%	387	1,272	161	610	28	106

15	American Home Prod.	72%	N/A	398	N/A	307	N/A	557
16	Sun Microsystems	72%	816	2,684	708	1,134	222	418
17	Compaq Computer	69%	234	392	142	310	104	702
18	Pfizer	69%	N/A	4,288	N/A	2,286	N/A	2,292
19	Kohl's	69%	99	256	47	115	10	23
20	Analog Devices	66%	44	466	15	116	13	38
21	Pharmacia	57%	N/A	955	N/A	237	N/A	439
22	Microsoft	56%	3,107	7,795	5,535	15,325	2,066	7,438
23	Texas Instruments	45%	N/A	985	N/A	763	N/A	207
24	UnitedHealth Group	41%	N/A	304	N/A	45	N/A	84
25	Intel	41%	887	5,234	506	2,928	415	2,375
26	Merrill Lynch	38%	N/A	1,446	N/A	443	N/A	428
27	Cardinal Health	35%	159	303	47	161	65	192
28	Marsh & McLennan	33%	N/A	392	N/A	169	N/A	102
29	Hewlett-Packard	33%	495	1,446	289	768	157	371
30	Automatic Data Proc.	28%	N/A	297	N/A	181	N/A	142
	Tax benefit from option exercises scaled by option exercises: Mean			31.9%		31.8%		31.7%
	Median			30.4%		30.4%		30.3%

*This table reports reported tax benefits from option exercises and estimated option exercises in 1998, 1999, and 2000 for those thirty firms with the highest ratios of option exercises to operating cash flow in 2000. The means and medians presented at the bottom of the table are for the ratio of reported tax benefits by estimated option exercises for each year.

The data provided through Execucomp is limited to the granting and exercise behavior of the top five executives, given that mandatory reporting centers on their behavior. It is possible, however, to extrapolate to all-employee grants and exercises because firms are required to report the share of total grants that correspond to the grants to the top five executives. While this process is straightforward for grants (because the share for the top five is based on grants), the extrapolation is somewhat more complicated for exercises requiring some additional assumptions.[16]

Table 2 provides evidence of several trends in the impact of option-granting and exercise behavior on the corporate profit base. First, the remarkable rise in aggregate grants and exercises by the top five officers of these firms over the period has resulted in grant values of over $16 billion in 2000 to just the top five officers. This trend corresponds to a tenfold increase over the decade. Second, option-granting behavior appears to be deepening within firms at a rapid pace as the share represented by the top five has decreased steadily from 29 percent in 1994 to 24 percent in 2000. Finally, the aggregate levels of grant values and exercises across all employees, across all firms, mushroomed to over $100 billion (in the case of annual exercises) in 2000, which corresponds to a sixfold increase over the decade. The deepening of the use of incentive instruments in organizations, the absolute magnitudes of the amounts involved, and the proliferation of repricing strategies suggests that the proliferation of options will likely survive a market downturn.[17]

Given the extrapolation involved in Table 2, it is useful to undertake a more detailed analysis of the largest 150 firms (by market value of equity) to ascertain the reliability of these estimates and the degree to which they correspond to actual tax benefits.[18] Table 3 summarizes the evidence

[16] Exercises for all employees were calculated by grossing up the exercises of the top five executives in a year by the average ratio of grants to the top five executives over grants to all employees for the sample period. If this average proved particularly low, this estimate was recalculated using a ratio of 20 percent to prevent any spurious overstatement of aggregate exercise levels. Implicit in this calculation is the assumption that all employees behave similarly in their exercise behavior. Core and Guay (2001) and Huddart and Lang (1996) compare the behavior of top executives and employees more generally and find that both are sensitive to recent price performance. Given the additional reporting requirements of the top five, it is conceivable that other employees are more opportunistic than the top five executives.

[17] Such a conclusion is necessarily speculative but the evidence on repricings in Brenner, Sundaram, and Yermack (2000) and recent high-publicity events surrounding CEO compensation suggest that levels of compensation are being adjusted on other margins to accommodate the levels of compensation recently enjoyed by CEOs.

[18] Selecting on market value may create some biases. First, by selecting on market value, these firms are likely to have some of the largest five-year returns. Thus, the potential for realized gains might be the largest in this group. At the same time, this group excludes

that I provided in appendix table 1 of Desai (2002) on the behavior of these firms and yields more precise—and comparable—estimates of the impact of the proliferation of options on the corporate tax base.[19] Using hand-collected data on the exercise of options, $78 billion was realized as proceeds from option exercises for just the top 150 firms in 2000. This figure corresponds to a mean ratio of proceeds from option exercises to operating cash flow of 29 percent. Table 3 highlights the growing absolute magnitude of the exercises and the growing ratio of those exercises to measures of corporate profitability during the late 1990s. The detail in appendix table 1 of Desai (2002) demonstrates that the use of options is proliferating through firms of all types and is not limited to high-technology or "new economy" companies. For various traditional consumer goods and financial services firms—including Colgate Palmolive, Safeway, and Home Depot—option net proceeds appear to comprise more than 10 percent of operating cash flow or net income.

The proceeds from option exercises might not translate into tax deductions at the firm level for various reasons. In particular, loss-making firms, firms employing incentive stock options, or firms employing variable-priced options may not realize comparable tax benefits, as indicated by their net proceeds from options exercises. Table 4 takes the 30 firms with the largest ratio of option exercises to operating cash flow from appendix table 1 of Desai (2002) and details their reporting of the tax benefits associated with option exercises.[20] As described in Hanlon and Shevlin (2001), the incipient reporting of these tax benefits need not reflect the actual tax benefits realized by firms. Nonetheless, 18 of the 30 firms with the largest ratios of option exercises to operating cash flow report tax benefits associated with the exercises. (This propensity to report tax benefit figures corresponds to the figures reported in Hanlon and Shevlin for Nasdaq firms.)

Unsurprisingly, there is considerable heterogeneity with some firms (for example, eBay) reporting limited, if any, tax benefits from the deductions associated with the exercise of stock options. Nonetheless, for all

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various smaller capitalization stocks that would have recently gone public and are most likely to have used ESOs heavily during their earlier years. Finally, the market value ranking was taken as of November 2001 and consequently does not include various firms that experienced rapid gains and subsequent losses during the period from 1996 to 2000 and may have experienced large proceeds from stock option realizations.

[19] A more detailed discussion of the methodology employed in constructing the sample underlying Table 3 is provided in the data appendix of Desai (2002).

[20] The tax benefits from employee exercises of stock options were collected for 1998 through 2000 by examining both the statement of cash flows and the statement of shareholders' equity in the consolidated financial statements reported in the 10-K (or other documents if incorporated by reference).

these firms reporting tax benefits, the average ratio of tax benefits to estimated net proceeds from option exercises is 32 percent across the three years, suggesting that the option exercise figures correspond to tax deductions that are being close to fully employed.[21] Taken together, Tables 2, 3, and 4 suggest that the proliferation of option instruments to compensate employees has had a significant role in creating a large and growing gap between tax income and book income and in changing the corporate profit base. Additionally, the more detailed study of the largest firms suggests that the estimates from Execucomp for the overall corporate universe are reliable estimates for the aggregate levels of the impact of option exercises on the corporate tax base.

5. TESTING A MODEL OF COSTLY SHELTERING WITH ACCOUNTING DATA

To isolate the degree to which the growing gap between tax income and book income is associated with increased tax-sheltering activity, this section begins with a discussion of the use of firm-level accounting data to isolate book income and tax income. In this subsection, special attention is paid to an alternative explanation for the emerging book income–tax income gap—increasingly aggressive earnings management. To motivate specific empirical tests of sheltering, a model of costly sheltering is then developed and implemented with these accounting-based measures of book income and tax income.

5.1 The Use of Accounting Data to Compare Book Income and Tax Income

While Figures 2 and 3 consider the gap between tax income and book income as generated by data from tax forms, an alternative methodology that employs accounting data can be used to generate a related notion of the gap between tax income and book income. As noted previously, the gap generated by this methodology has an important difference from the gap generated using data from tax forms: the accounting of stock option activity removes this deduction from both tax income and book income. Thus, the gap between estimates of tax income and book income generated from accounting data is unlikely to be associated with stock option activity but could be associated with depreciation discrepancies or the reporting of foreign source income as well as tax-sheltering activity. The

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[21] Reporting of the tax benefits does not appear to be standardized nor, as demonstrated by Hanlon and Shevlin (2001), to be correlated necessarily with the tax deductions actually taken by firms, so it is not clear that there is any sample bias by selecting on those firms with the largest ratios.

use of accounting data also holds out the possibility of using micro data more readily than what is available from aggregates based on tax forms.

Inferring tax income from accounting reported book income involves various alternative measures of tax expense. Current and deferred tax expenses are jointly considered to capture permanent and temporary differences between tax and accounting reporting of income. Plesko (2003) reviews the varied alternative methods for calculating tax expenses and their correlations with actual tax income.[22] The analysis that follows employs the measure of tax liability associated with Stickney and McGee (1982).[23] Use of the measures argued for by Porcano (1986), Zimmerman (1983), and Shevlin (1987) do not yield dissimilar results in the regression results that follow.

Figure 4 reports calculated tax income and book income, generated from accounting statements, in 1992 dollars for a large universe of public companies that comprise an unbalanced panel from 1982 to 2000. For this large sample, there appear to be three distinct phases of the relationship between book income and tax income. First, until the Tax Reform Act (TRA) of 1986, book income far exceeded tax income. Second, from TRA through the early 1990s, differences between book income and tax income became considerably smaller. Finally, from the early 1990s, book income has begun to diverge consistently from tax income. This gap reassuringly mirrors the gap between book income and tax income presented in Figure 2.

While deductions associated with the net proceeds from stock option exercises are not likely to be part of that gap, it is possible that changed patterns of depreciation differences and reinvested earnings abroad might contribute to this gap. Applying the same figures from Table 1 to the gap in Figure 4 demonstrates that there still appears to be a considerable gap between actual aggregate book income and simulated book income for much of the 1990s. The adjustments associated with depreciation differences and reinvested earnings abroad are for *all* firms with assets greater than $250 million, so the gap between book income and calculated tax income would be even larger during the 1990s because the evidence in Figure 4 is for only 6,000 firms. This gap appears to persist from 1982 to 2000 in a balanced panel of 500+ firms, and from 1992 to 2000 for an unbalanced panel for which there exists detailed compensation data, as presented in appendix figures 1a and 1b of Desai (2002).

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[22] See also Callihan (1994); Kinney and Swanson (1993); Omer, Molloy, and Ziebart (1991); and Dworin (1985) for additional discussion of the varied methodologies in using Compustat data and the relative merits of alternative measures.

[23] This analysis involves total tax expense, with an adjustment for deferred tax expenses.

FIGURE 4. Calculated Book and Taxable Income for All Public Companies, 1982–2000

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	5,181	5,259	5,337	5,537	5,673	5,646	5,488	5,286	5,371	5,481	5,887	6,497	6,854	7,558	7,669	7,407	7,530	7,061	4,440

Taxable income —— Excess depreciation · · · · Reinvested earnings abroad —— Book income

Year

Billions of dollars
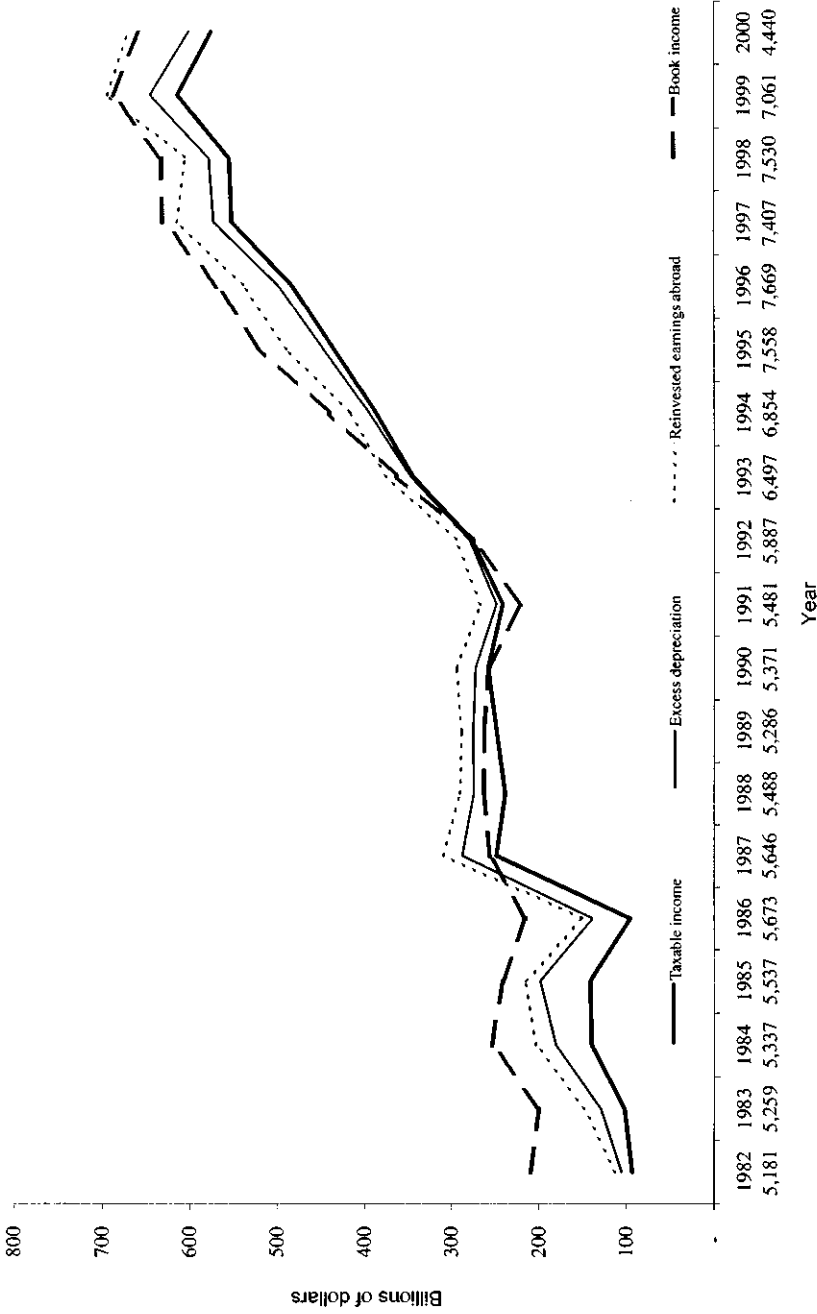
Taxable income and book income are drawn from Compustat, as described in the text, and are presented for an unbalanced panel from 1982 to 2000. The number of firms for each year is presented below the year. Excess depreciation and reinvested earnings abroad are the same as in Table 1 and Figure 3.

The gap between tax income and book income could be associated with a secular increase in managerial efforts to boost book income through earnings management·rather than a secular increase in efforts to depress tax income. As discussed above, researchers have struggled to find aggregate evidence of a meaningful, sustained role for earnings management. Nonetheless, it is useful to consider the motives and evidence related to earnings management so that empirical tests can attempt to discriminate between these two explanations. Theories of earnings management typically try to explain management of earnings through smoothing, whereby managers intertemporally shift income to accomplish different objectives. Managers may smooth earnings to signal firm quality (Barnea, Ronen, and Sadan, 1975), to influence future shareholders and long-run share prices (Dye, 1988; Goel and Thakor, 2003), to derive incumbency rents (Fudenberg and Tirole, 1995), or to lower borrowing costs due to reduced perceived probabilities of financial distress (Trueman and Titman, 1988). For smoothing to explain the gaps depicted in Figure 3 would require a massive, sustained borrowing from future earnings during the 1990s. The earnings smoothing explanations of Figure 3 would also require that the period during which earnings have been mortgaged has yet to occur. Most of these models correspond to quarterly, and possibly annual, smoothing of income, so it is hard to imagine the managerial motives that could correspond to the long-run acceleration of income that would be required for earnings smoothing to explain the gaps in Figure 3.[24]

Empirical efforts to isolate earnings management typically employ one of three methods that provide some instruction for the empirical tests that follow. First, earnings management and smoothing can be detected by looking for evidence of discretionary accrual accounting. In particular, Jones (1991) develops a model of discretionary accruals that attempts to isolate firms or industries with large amounts of discretion in accrual methods. Studies tend to emphasize those industries with particularly large opportunities for discretionary accruals, such as those provided in banking, with provisions for loan loss reserves, in searching for evidence of earnings management. Second, Burgstahler and Dichev (1997) and Degeorge, Patel, and Zeckhauser (1998) try to detect earnings management by examining the distribution of earnings around threshold levels, such as the expected earnings of financial analysts. Finally, the underlying economics of specific accounts, such as valuation allowances for deferred tax assets, as in Miller and Skinner (1998), can be modeled, and then actual

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[24] In contrast to earnings smoothing, earnings management could take the form of fraudulent reporting of book income. This practice is more difficult to distinguish from tax sheltering, and efforts to disentangle the two are considered below.

accrual behavior can be compared with predicted levels to isolate discretionary accruals. The most convincing evidence of earnings management comes from studies of distributions of earnings around threshold levels, while other efforts reach contradictory conclusions regarding increased levels of earnings management and the overall relevance of earnings management. The industry-specificity of discretionary accruals and the objective of smoothing earnings relative to thresholds suggest that industry fixed effects, as well as sorting firms by relative levels of the variability of book income relative to tax income, might usefully distinguish earnings management explanations from tax-sheltering activities.

5.2 A Model of Corporate Tax Shelter Activity

To motivate the empirical tests of increased sheltering, the appendix to this paper specifies a model of costly sheltering that suggests that increased levels of sheltering will be evidenced by a distinctive relationship between book income and tax income at low levels of tax income. More specifically, the model suggests that sheltering will be reflected by a relatively flatter relationship between book income and tax income at low levels of tax income. The model generates an estimating equation [equation (7) in the appendix] that is tested through piecewise linear regressions between book income and tax income. Increased levels of sheltering will be reflected in a flattening of the relationship between tax income and book income at low levels of tax income.

The intuition behind this result comes from the nature of the costs of sheltering in the model developed in the appendix. It is useful to imagine a world without sheltering initially. In such a world, estimation of equation (7) would result in a 45-degree line that compared tax income to book income and that passed through the origin. The impact of sheltering in altering the shape of that line would be a function of the nature of the costs of sheltering. In particular, the costs of sheltering in this model would be associated with the amounts sheltered and not the levels of true income, conferring no advantage on those firms with large amounts of true economic income. As a consequence, all firms would shelter so that they avoid the same amount of tax. If there were no progressivity in the tax schedule, then estimation of equation (7) would still result in a 45-degree line, but the line would intersect the y axis at some nonzero level of book income, reflecting the fact that all firms shelter some income to avoid a given amount of taxes. Progressivity in the tax schedule, however, would result in a flattening of the relationship between book income and tax income at low levels of tax income because more income can be sheltered, given the lower tax rates and the constant amount of tax liabilities being avoided. In turn, increased levels of sheltering would be associated with

a flattening of the relationship between book income and tax income at low levels of tax income.[25]

Alternative specifications of the costs of sheltering would result in distinctive patterns in the relationship between tax income and book income. For example, if costs of sheltering were a function of the fraction of true income sheltered, thereby suggesting that firms with large amounts of income would find it easier to shelter more income, then increased sheltering would be associated with the initial 45-degree line taking on a parabolic shape. The specification employed above and tested below has the advantage of being consistent with taxing authorities that maximize revenue collection and with the notion that firms of different sizes face the same probability of detection when sheltering a given amount of income.

5.3 Testing the Model of Tax Sheltering

As indicated above, increasing levels of tax sheltering should be evident through a changed relationship between book income and tax income at low levels of tax income. The analysis in Table 5 and Figures 5 and 6 employs a piecewise linear regression framework for relating the logarithm of book income to the logarithm of tax income, and traces that relationship through the decade. This approach has the advantage of tracing the changing relationship of tax income to book income over the decade and testing for whether the disparity between book income and tax income has become most pronounced for income tax filers with small amounts of tax income.

In Table 5, observations are aggregated into three distinct subsample periods to isolate the trends in the relationship between book income and tax income. The specification employing data from 1992 to 1994 demonstrates that coefficients become larger and more statistically significant as tax income becomes larger. The more interesting pattern is the comparison across time periods. First, coefficients on the splines at low levels of tax income become considerably smaller, dropping from 0.61 and 0.69 in 1992–1994 to 0.22 and 0.60 in 1998–2000, respectively. Additionally, the significance of these estimates drops, and the overall degree to which tax income predicts book income is reduced. Finally, the decreased levels of coefficients are not nearly as pronounced at higher levels of tax income.

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[25] While it is possible to recast the problem of costly sheltering as a problem of costly earnings management, a model of earnings management where inflating book income is costly would not generate the curvature at low levels of tax income as it arises from the progressivity of the tax schedule. Only if zero earnings were a particularly important threshold level, and the costs of earnings management were a function of such a threshold, is it possible to arrive at a theoretical model of earnings management that delivers corresponding empirical predictions. The empirical analysis below employs measures of the variability of earnings to distinguish between these models.

TABLE 5

Piecewise Linear Regression of Book Income on Taxable Income With and Without Industry Fixed Effects, 1992–1994, 1995–1997, 1998–2000*

|	1992–1994		1995–1997		1998–2000	
	No fixed effects	Fixed effects	No fixed effects	Fixed effects	No fixed effects	Fixed effects
Constant	1.3091 (0.3728)	1.3175 (0.3888)	2.5274 (0.2885)	2.5313 (0.2619)	2.9443 (0.4228)	2.7976 (0.3982)
Spline 1	0.6101 (0.1588)	0.6090 (0.1646)	0.1719 (0.1243)	0.1626 (0.1137)	0.2209 (0.1526)	0.2846 (0.1466)
Spline 2	0.6852 (0.2032)	0.7562 (0.2038)	0.8781 (0.1436)	0.9478 (0.1367)	0.6046 (0.2360)	0.4861 (0.2306)
Spline 3	0.9361 (0.2440)	0.8258 (0.2321)	0.8224 (0.1854)	0.7543 (0.1799)	0.9907 (0.2856)	1.1018 (0.2909)
Spline 4	0.9662 (0.1726)	1.0494 (0.1678)	1.0021 (0.2379)	1.0285 (0.2268)	1.1847 (0.2906)	1.1239 (0.2992)
Spline 5	0.8916 (0.1947)	0.8860 (0.1919)	0.8546 (0.2146)	0.8370 (0.2020)	0.7383 (0.2765)	0.8768 (0.2755)
Spline 6	0.9957 (0.1520)	0.8900 (0.1483)	0.8358 (0.2018)	0.8139 (0.1930)	1.1002 (0.2643)	1.0636 (0.2512)
Spline 7	1.1361 (0.1618)	1.1440 (0.1544)	1.3056 (0.1906)	1.3244 (0.1939)	1.0382 (0.2213)	0.8919 (0.1958)
Spline 8	0.8743 (0.1133)	0.8135 (0.1122)	0.8199 (0.1302)	0.7767 (0.1401)	0.8000 (0.1474)	0.8953 (0.1380)
Spline 9	1.0190 (0.0773)	1.0284 (0.0792)	1.0207 (0.0645)	0.9718 (0.0775)	0.9592 (0.1056)	0.8450 (0.1131)
Spline 10	0.9946 (0.0317)	0.9624 (0.0367)	1.0076 (0.0263)	1.0436 (0.0342)	1.0701 (0.0364)	1.1052 (0.0447)
R^2/adjusted R^2	0.9096	0.9162	0.8923	0.9056	0.8626	0.8766
Number of observations	1,229	1,229	1,384	1,384	942	942
Categories absorbed	—	62	—	62	—	61

* The dependent variable in all specifications is the logarithm of book income summed across relevant years. The percentile splines create separate coefficients, depending on the logarithm of taxable income summed across relevant years. Columns 2, 4, and 6 employ industry fixed effects.

FIGURE 5. *Book Income Versus Taxable Income, Spline Estimates by Three-Year Intervals with Industry Fixed Effects, 1992–2000*
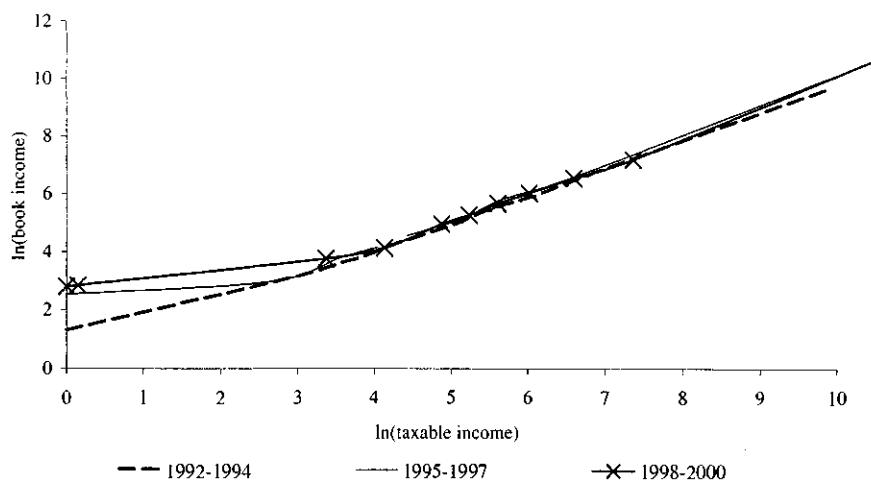
The three lines in the figure are constructed using the coefficients of spline regressions reported in Table 5, where industry fixed effects are employed for the groups of years 1992–1994, 1995–1997, and 1998–2000.

FIGURE 6. *Book Income Versus Taxable Income, Spline Estimates by Year with Industry Fixed Effects, 1992–2000*
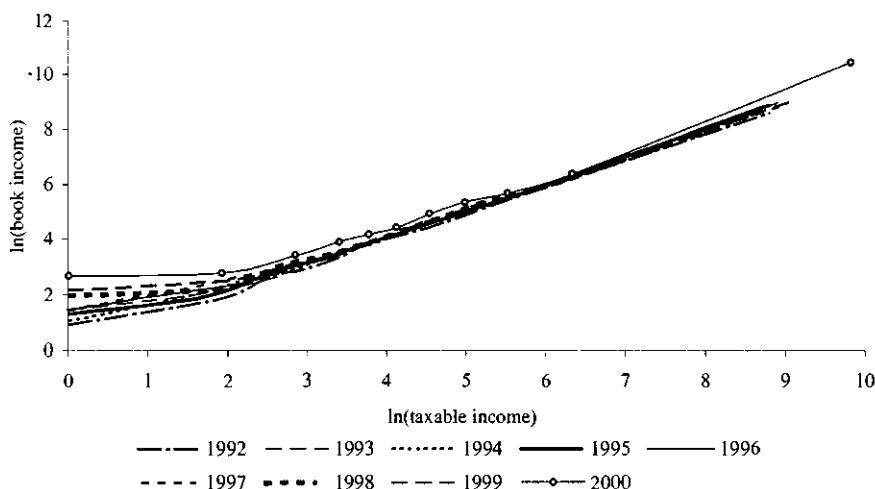
The lines in the figure are constructed using the coefficients of spline regressions reported in Table 6 of Desai (2002), where industry fixed effects are employed for each year from 1992 to 2000.

Given the industry-specificity of discretionary accrual opportunities, it is useful to employ industry fixed effects in these piecewise linear regressions in an effort to isolate a tax-sheltering explanation for this phenomenon from an earnings management perspective. The results presented in Table 5, with the inclusion of industry fixed effects, demonstrate that within-industry variation provides even stronger evidence for a weakening of the relationship between book income and tax income at low levels of tax income. The coefficients from the three specifications employing industry fixed effects are used to construct the lines in Figure 5. This figure provides the flattening of the relationship between book income and tax income, as predicted in the model of costly sheltering over the course of the 1990s. This same exercise is repeated by year with industry fixed effects, and the results are presented in graphical form in Figure 6. Figure 6 provides similar results because the coefficients on the first spline are positive and significant in early years of the sample and because they approach 0 by 2000. As reported in Desai (2002), the explanatory power of the regressions that underlies Figure 6 declines over the sample period, further emphasizing the reduced link between book income and tax income.

This regression evidence is difficult to reconcile with alternative rationales for the disparity between tax income and book income. For example, if the differential measurement of depreciation or of reinvested earnings abroad were to account wholly for this changed pattern, this differential measurement would have to have become more concentrated among low-tax-income firms during the 1990s. While these possibilities appear unlikely, it is possible that the accounting of option exercises, if firms follow clean surplus accounting, would have reduced tax income, as measured by accounting statements, for young growth firms with low tax income. Controlling separately for the levels of option activity in these regressions demonstrates that option activity cannot explain this decoupling of book income and tax income at low levels of tax income. To ensure that results are not disproportionately reflecting the different behavior of small or large firms, appendix table 2 and appendix figures 1a and 1b of Desai (2002) attempt the same piecewise linear regressions provided in Table 5 by dividing the sample at the median level of sales. The same patterns appear to hold.

In addition to using industry fixed effects to separate earnings management explanations from tax-sheltering explanations, it is possible to consider the relative variability of book income and tax income in an effort to segregate active earnings managers from nonearnings managers.[26] To

[26] Such a distinction resembles other studies that attempt to isolate earnings smoothers by the relative absence of variability in reported earnings, as in Myers and Skinner (2001), who study firms with consistent increases in reported earnings.

TABLE 6

Piecewise Linear Regression of Book Income on Taxable Income with Industry Fixed Effects, 1992–1994, 1995–1997, 1998–2000*
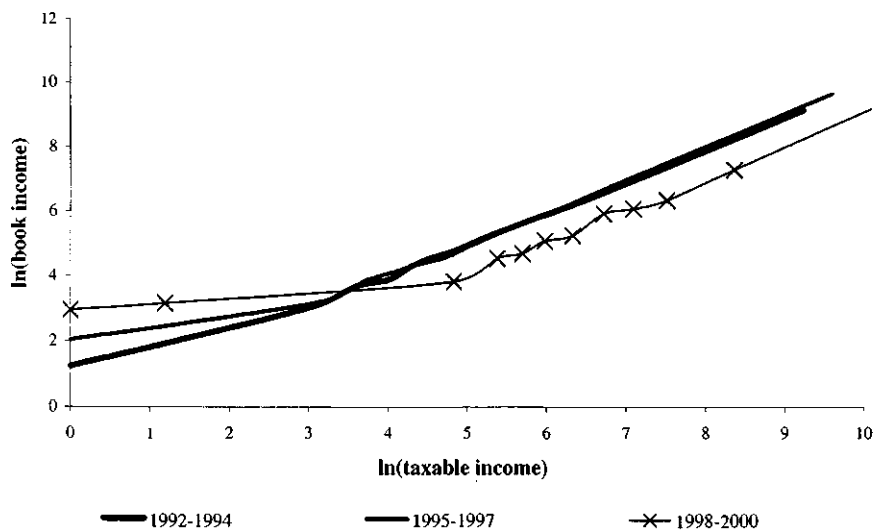
	Earnings-smoothing firms			Nonearnings-smoothing firms		
	1992–1994	1995–1997	1998–2000	1992–1994	1995–1997	1998–2000
Constant	1.2383	2.0452	2.9492	1.3308	2.7289	2.4859
	(0.6463)	(0.2573)	(0.5058)	(0.5457)	(0.4368)	(0.5010)
Spline 1	0.5950	0.3673	0.1806	0.6395	0.0802	0.4503
	(0.2472)	(0.0898)	(0.1430)	(0.2515)	(0.2096)	(0.2332)
Spline 2	1.1182	1.1662	1.2951	0.6115	0.8189	0.2631
	(0.2608)	(0.1845)	(0.2963)	(0.2432)	(0.1964)	(0.3181)
Spline 3	0.5037	0.7375	0.5001	0.8447	0.7807	0.7671
	(0.3286)	(0.2063)	(0.3719)	(0.2442)	(0.2901)	(0.3013)
Spline 4	1.4327	1.0750	1.3600	0.9654	0.8755	1.4259
	(0.2740)	(0.2999)	(0.4390)	(0.3519)	(0.3312)	(0.3657)
Spline 5	0.6570	0.7543	0.4971	1.0318	1.0981	0.9210
	(0.2250)	(0.2737)	(0.3181)	(0.3084)	(0.2787)	(0.3382)
Spline 6	1.1333	1.0672	1.7572	0.7238	0.4744	0.5751
	(0.2493)	(0.1892)	(0.3039)	(0.2155)	(0.3604)	(0.3955)
Spline 7	1.0332	0.9333	0.4019	1.2591	1.5830	1.4016
	(0.1946)	(0.1858)	(0.3154)	(0.2243)	(0.3078)	(0.2877)
Spline 8	0.9188	0.9695	0.6261	0.7336	0.6411	0.8319
	(0.1113)	(0.1464)	(0.2888)	(0.1787)	(0.2304)	(0.1804)
Spline 9	0.9860	1.0733	1.1190	1.0461	0.9444	0.8093
	(0.1422)	(0.1049)	(0.1636)	(0.1095)	(0.1095)	(0.1503)
Spline 10	1.0162	1.0260	1.0885	0.9285	1.0567	1.0879
	(0.0570)	(0.0440)	(0.0672)	(0.0508)	(0.0528)	(0.0680)
Adjusted R^2	0.9382	0.9432	0.8896	0.8990	0.8839	0.8817
Number of observations	535	604	434	694	780	508
Categories absorbed	55	57	57	60	62	59

*The dependent variable in all specifications is the logarithm of book income in given years. The percentile splines create separate coefficients, depending on the logarithm of taxable income in given years. Columns 1, 2, and 3 report specifications for those firms with a below median ratio of standard deviation of book income to standard deviation of taxable income. Columns 4, 5, and 6 report specifications for those firms with an above median ratio of standard deviation of book income to standard deviation of taxable income.

do so, ratios of the standard deviations of book income to tax income are calculated for all the firms in the sample. This ratio has a median of 0.91, and firms with a ratio below the median are considered earnings-smoothing firms and firms with a ratio above the median are considered nonsmoothers. If earning management were a primary driver of the breakdown of the relationship between book income and tax income at low levels of tax income, then firms with different propensities to smooth book income should exhibit a different relationship between tax income and book income at low levels of tax income over the course of the decade. The evidence provided in Table 6 and Figures 7 and 8 suggest otherwise because both earnings smoothers and non–earnings smoothers exhibit similar underlying trends over the course of the decade with respect to a flattening of the book income–tax income relationship at low levels of tax income.

The regression framework explored in Tables 5 and 6 and Figures 5 to 8 provides evidence that is consistent with the model of tax sheltering

FIGURE 7. *Book Income Versus Taxable Income, Earnings-Smoothing Firms, Spline Estimates by Three-Year Intervals with Industry Fixed Effects, 1992–2000*

The three lines in the figure are constructed using the coefficients of spline regressions reported in Table 6 for the groups of years 1992–1994, 1995–1997, and 1998–2000. The figure employs regressions for two samples of firms that are divided at the median ratio of the standard deviation of book income to the standard deviation of taxable income. Firms with ratios above the median ratio are termed *nonearnings-smoothing firms*, and those with ratios below the median ratio are termed *earnings-smoothing firms*.

FIGURE 8. *Book Income Versus Taxable Income, Nonearnings-Smoothing Firms, Spline Estimates by Three-Year Intervals with Industry Fixed Effects, 1992–2000*
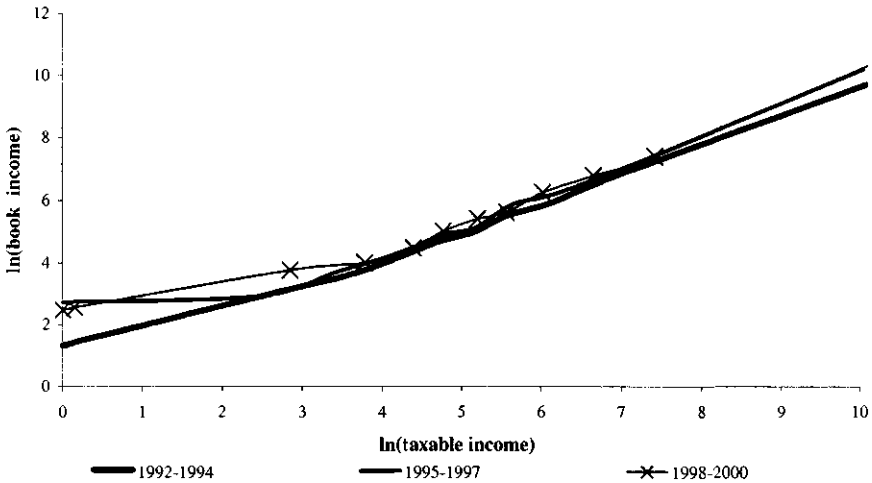
The three lines in the figure are constructed using the coefficient of spline regressions reported in Table 6 for the groups of years 1992–1994, 1995–1997, and 1998–2000. The figure employs regressions for two samples of firms that are divided at the median ratio of the standard deviation of book income to the standard deviation of taxable income. Firms with ratios above the median ratio are termed *nonearnings-smoothing firms,* and those with ratios below the median ratio are termed *earnings-smoothing firms.*

provided in section 5.2. The implication of these results is that sheltering became considerably less costly, either through lowered probabilities of detection or perceived lower penalties, and that firms became more aggressive during the 1990s. The alternative explanation of a secular increase in earnings management is difficult to reconcile with the data provided in the paper. First, earnings management theories typically do not allow for such long-run intertemporal shifting of income, as would be required to explain the aggregate trends in Figure 3. Second, if earnings management opportunities are particularly associated with discretionary accrual opportunities in some industries, then within-industry variation should have reduced, rather than increased, evidence of this underlying behavior in the micro evidence. Finally, if increased earnings management were the cause of the flattening of the relationship between book income and tax income at low levels of tax income, simple distinctions in the relative variability of book income and tax income should have demonstrated more pronounced differences in this breakdown. While it is not possible to rule out earnings management definitively—particularly

fraudulent book reporting of income—as a source of some of the aggregate phenomena observed in Figure 3, this micro analysis suggests that the distinctive way in which the relationship between book income and tax income has deteriorated over the decade is consistent with increased levels of costly sheltering.

6. CONCLUSION

This paper attempts to illuminate the debate on tax sheltering by disentangling varied explanations for the breakdown in the relationship between tax income and book income over the last decade. First, the paper demonstrates that identifiable factors that once accounted for the difference between tax income and book income fail to account for the large gap between book income and tax income in more recent years. In particular, by 1998, more than half of the difference between tax income and book income—approximately \$154.4 billion, or 33.7 percent of tax income—cannot be accounted for by these historically relevant measures of the discrepancy between tax income and book income. Second, the paper demonstrates that within those identifiable factors, changed patterns in employee compensation are creating the largest disparity between book income and tax income. By 1998, different treatment of employee options accounted for nearly three times as much of the difference between book income and tax income as did distinct definitions of depreciation.

By examining this same disparity between book income and tax income using accounting data, this paper demonstrates that this breakdown has been particularly pronounced at low levels of tax income and has degenerated progressively over the decade. These results are consistent with the model of costly tax sheltering presented in the paper and decreased costs of sheltering over the decade leading to greater gaps between tax income and book income. Tests to check if these results are driven by increased levels of earnings smoothing do not appear to diminish the results that suggest that increased tax sheltering is responsible for the distinctive breakdown in the relationship between book income and tax income.

The large discrepancy reported between simulated book income and actual book income from Figure 3, along with the regression evidence, suggests that efforts by firms to circumvent tax payments are becoming more significant, cheaper to implement, and harder to detect. These developments provide yet another reason to reevaluate the manner in which corporate earnings are taxed because the underlying developments driving these phenomena—including increased access to global opportunities and the rapid development of financial innovations—are unlikely to de-

cline in importance in the near future. Similarly, these trends illustrate the need to revisit the rationales for distinctive book and tax reporting, and the degree and manner in which firms are forced to reconcile book income and tax income.

APPENDIX

In order to motivate the empirical tests of increased tax sheltering, it is useful to specify a model of costly tax sheltering. Let I equal true economic income, B equal reported book income, and T equal reported tax income. Book income is presumed to correspond to true economic income with noise, so that:

$$B = Ie^u$$

where

$$u \sim N(0, \sigma^2) \tag{1}$$

To specify what tax income would be, let s equal sheltered income, which is associated with costs $\gamma(s)$, which in turn are characterized by $\gamma'(s) > 0$ and $\gamma''(s) > 0$. In this setting, the costs of sheltering correspond only to the amount of income sheltered and not the amount of true economic income. In other words, larger firms have no advantage in sheltering income relative to smaller firms. As a consequence, tax income is given by:

$$T = I - s - \gamma(s) \tag{2}$$

and the tax rate is a function of this taxable income, as represented by $\tau[I - s - \gamma(s)]$.

Firms choose the amount of income to shelter by solving:

$$\max_s [I - s - \gamma(s)]\{1 - \tau[I - s - \gamma(s)]\} + s \tag{3}$$

which yields the first-order condition:

$$-[1 + \gamma'(s)][1 - \tau(\cdot)] + [I - s - \gamma(s)][1 + \gamma'(s)]\tau'(\cdot) + 1 = 0 \tag{4}$$

To analyze this problem further, it is useful to consider two regions of the tax schedule: one where there is progressivity and one where there

is no progressivity. At sufficiently high levels of income, the tax rate will exhibit no progressivity; $\tau'(\cdot) = 0$, and equation (4) will collapse to:

$$[1 + \gamma'(s)][1 - \tau(\cdot)] = 1 \tag{5}$$

At such levels of income, levels of sheltering will no longer vary with levels of income because:

$$\frac{ds}{dI} = 0$$

As a consequence, it is possible to rewrite the level of tax income in equation (2) as:

$$T = I - s - \gamma(s) = I - \bar{k} \tag{6}$$

Taking logarithms of both sides of equations (6) and (1) and employing a first-order Taylor approximation, it is possible to rewrite equation (1) as:

$$ln(B) = ln(I) + \frac{k}{I} + u \tag{7}$$

which in turn becomes the estimating equation in the empirical analysis that follows.

When levels of income are such that $\tau'(\cdot) \neq 0$, the first-order condition in equation (4) can be rewritten as an expression for tax income:

$$T = [I - s - \gamma(s)] = \frac{(1 - \tau) - \dfrac{1}{[1 + \gamma'(s)]}}{\tau'(\cdot)} \tag{8}$$

To make this equation tractable, it is useful to transform it into:

$$F(T) = \frac{-1}{1 + \gamma'(s)} \tag{9}$$

where $F(x) = [\tau'(\cdot)x + \tau(\cdot) - 1]$, and to define the inverse function as $G(z) \equiv F^{-1}(z)$. This specification allows tax income to be rewritten as:

$$T = G\left(\frac{-1}{1 + \gamma'(s)}\right)$$ (10)

The curvature of $G(\cdot)$ will be small when the curvature of $F(\cdot)$ is high, so it becomes clear that at low levels of income

$$\frac{dT}{dI} \cong 0.^{27}$$

With respect to the estimating equation provided in equation (7), this model suggests that the relationship between book income and tax income will be distinctive at low levels of tax income, necessitating a piecewise linear model to estimate equation (7). More specifically, the model suggests that tax sheltering will be reflected by a relatively flatter relationship between book income and tax income at low levels of tax income. Correspondingly, increased levels of tax sheltering will be reflected in a flattening of the relationship between tax income and book income.

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[27] More precisely, this equation requires the additional assumption that $\tau''(\cdot) = 0$ and that $\gamma''(\cdot) \ll \tau'(\cdot)$ because

$$\frac{dT}{dI} = 1 - \frac{2\tau'(\cdot)[1 + \gamma'(s)]^3}{\gamma''(s) + 2\tau'(\cdot)[1 + \gamma'(s)]^3}$$

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