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7 Notes on the Tax Treatment of Structures

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More than three-quarters of the United States' tangible capital stock represents structures. Despite their relatively low rates of depreciation, structures account for more than half of all gross fixed investment in most years. Tax policies potentially have a major impact on both the level and composition of investment in structures. This point is explicitly recognized in most discussions of the effects of capital income taxation. Two aspects of the taxation of structures—the relative burden placed on structures as opposed to equipment investment and the nontaxation of owner-occupied housing under the income tax—have attracted substantial attention in recent years. This paper explores these two aspects of the taxation of structure investments.

The Treasury (1984), in its recent tax reform proposal, pointed to the extra tax burdens placed on structures relative to equipment as a major defect of the current accelerated cost recovery system. The 1985 *Economic Report of the President* echoes this sentiment, concluding that, "The effective tax rate . . . is lower for equipment than for structures. Because different industries utilize different mixes of capital goods, differential taxation of assets results in differential taxation of

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capital income by industry. The average effective Federal corporate tax rate on fixed investment varies widely by industry." The decision of the Congress in 1984 and 1985 to scale back the depreciation benefits to structures but not to equipment is perhaps surprising in light of these conclusions.

The allegedly favorable treatment of owner-occupied housing has long been a target of academic critics of the tax system although suggestions for reform have generated little if any political support. The failure to include imputed rent is often treated as a tax subsidy. A large literature summarized in Rosen (1985) has estimated the welfare loss thought to come from tax-induced changes in tenure choice. And the corporate income tax is often opposed on the ground that it exacerbates the distortions caused by the nontaxation of owner-occupied housing.

While the tax system may well have a potent impact on the level and composition of structure investment, this paper argues that conventional analyses of these effects are very misleading. We reach two main conclusions. First, under current tax law, certain types of structure investment are very highly tax-favored. Overall, it is unlikely that a significant bias toward equipment and against structures exists under current law. Second, the conventional view that the tax system is biased in favor of homeownership is wrong. Because of the possibility of tax arbitrage between high-bracket landlords and low-bracket tenants, the tax system has long favored rental over ownership for most households. The 1981 reforms, by reducing the top marginal tax rate, reduced this bias somewhat.

Many earlier analyses have reached different conclusions because of their failure to take account of several aspects of the behavior of real world investors which serve to reduce the effective tax burden on structure investment. First, structures may be depreciated more than once ("churned") for tax purposes. Particularly where devices can be found to reduce the effective rate of capital gains tax below the statutory rate, the effective purchase price of a structure may be reduced substantially by the knowledge that it can be depreciated several times. Second, some types of structures, particularly commercial buildings, are very easy to borrow against because they are quite liquid assets. To the extent that the tax system favors the use of debt finance they too will be favored. Third, certain types of investments, especially residential rental capital, facilitate tax arbitrage.

The paper is organized as follows. Section 7.1 reviews trends in structure investment over the past few years and highlights the dramatic increase in the rate of investment in commercial buildings that has occurred in recent years. Some information on the ownership of different types of structure investments is also presented. Section 7.2 describes the tax rules governing the churning of capital assets and considers the circumstances under which the churning of assets will be tax-advantaged. Section 7.3 considers the role of leverage and raises the possibility that structure investments are favored under current tax law because of their ability to carry debt. Section 7.4 examines the tax advantages to homeownership and shows that the tax law actually provides incentives for most households to rent their homes. Section 7.5 concludes the paper by discussing the implications of our results for tax reform and future research.

7.1 Patterns of Structure Ownership and Investment

A number of studies, notably Auerbach (1983) and Fullerton and Henderson (1984), have made rather elaborate calculations of the deadweight losses arising from the failure of the tax system to impose equal burdens on different types of corporate investment. In large part it is the assumed differential taxation of equipment and structures that drives the results of these studies. This differential taxation creates production inefficiencies within industries and also favors some industries at the expense of others. Despite the results of many academic experts and the results of staff analyses suggesting that the then current law was heavily biased in favor of equipment, the Congress in 1984 chose to scale back the depreciation benefits associated with structure investments while not altering the tax treatment of equipment investments. Tax legislation in 1982 had reduced somewhat the value of depreciation allowances for equipment, but standard calculations still showed equipment to be strongly tax-favored over structures. The 1984 action was taken at least in part because of a widespread perception that the 1981 acceleration of depreciation allowances had led to the rapid growth of tax shelters based on investments in structures. Additional tax law changes in 1984 and 1985 further reduced the value of depreciation allowances for structures while leaving equipment allowances intact.

7.1.1 Ownership of Structures

How can one square the perception that structures are a common tax shelter with the calculations suggesting that they are among the most heavily taxed assets? Part of the answer may be found in table 7.1, which examines the composition of the stock of structures in 1983, the most recent year for which data are available. The first row of the table shows that corporate structures represented less than a quarter of all structures in 1983 and that they accounted for less than half of all depreciable structures.

While detailed data are not available on the ownership of different types of structures, it is clear from the data in the table that the vast majority of residential capital represents owner-occupied housing with the bulk of the remaining residential capital representing partnerships

Table 7.1 The Ownership of Structures in 1983

	Corporate	Other Business	Owner-occupied Housing
Total Structures	1075.6 (24.1%)	1124.4 (25.2%)	2269.5 (50.8%)
Nonresidential Structures	1005.8 (61.6%)	628.1 (38.4%)	—
Residential Structures	69.8 (2.5%)	496.3 (17.5%)	2269.5 (80.0%)

Source: Musgrave (1984).

Note: Figures in the table refer to current dollar net capital stocks. Numbers in parentheses are percentages of row totals. It is assumed that all corporate residential structures are rental properties.

and proprietorships. Only a negligible fraction of residential capital is held in corporate form. The ownership of nonresidential structures is more complex. It appears likely to us that most of the noncorporate structures are commercial buildings owned by partnerships or proprietors. The other main categories of nonresidential structures—industrial buildings, mines, and public utility structures—are probably largely owned by corporations.

7.1.2 Patterns of Structures Investment

Table 7.2 presents some information on the composition of structure investment in 1980, before the introduction of ACRS, and in 1985. The table highlights a number of aspects of structure investment that seem critical in assessing neutrality arguments suggesting a tax bias against structure investment. First, a substantial share of structure investment takes place in forms where the effects of taxes cannot sensibly be analyzed in isolation. In 1985, for example, public utilities accounted for about 20% of all investment in structures. The profit rate of most public utilities is regulated and in many cases the benefits associated with tax incentives, especially the investment tax credit, are passed on to consumers. Public utility firms may have objectives more complicated than simple unconstrained profit maximization. About 40% of structure investment takes place in forms where other public microeconomic policies are intimately involved in guiding the allocation of resources—educational and hospital buildings, mining and petroleum, and farming. As with public utilities examining the effects of tax benefits in isolation is likely to be very misleading. The remaining 40% of structure investment takes place in industrial and commercial buildings where tax considerations are presumably of primary importance. What is perhaps surprising is that industrial buildings (plants) represent only

Table 7.2 Structures Investment in 1980 and 1985 (billions of constant 1982 dollars)

	1980	1985
Total Structures Investment	273.8	338.9
Nonresidential Structures	136.2	165.8
Industrial Buildings	16.0	14.2
Commercial Buildings	34.7	54.2
Office Buildings	15.3	28.3
Other	19.4	25.9
Education, Religious & Hospital	7.9	8.6
Mining & Petroleum	31.7	39.8
Public Utilities	30.3	31.8
Farm Structures	6.1	3.4
Other	9.5	13.8
Residential Structures	137.6	173.1
Owner-occupied	60.7	95.3
Rental	76.9	77.8

Source: Unpublished data, Bureau of Economic Analysis, U.S. Department of Commerce.

about 10% of all nonresidential structure investment. Commercial buildings account for the remaining 30% of nonresidential structure investment.

Second, the information in the table indicates that there has been a fairly dramatic shift in nonresidential structure investment toward commercial buildings and in particular office buildings over the last 5 years. The dollar volume of investment in commercial buildings more than doubled between 1980 and 1985 compared to an increase of less than 50% in overall structure investment. The industrial building category has been particularly weak over the same period, so commercial building investment is now 4 times as great as industrial building investment compared with a ratio of 2 to 1 in 1980. It is perhaps ironic that the 1981 tax cut, which had as a major objective spurring corporate investment, has been followed by a dramatic spurt in commercial building investment—a large part of which occurs outside the corporate sector. Between 1980 and 1985, real investment in commercial structures increased by 56%, of which office building investment rose 85%, compared to 22% increase in overall nonresidential construction and a 26% increase in equipment investment. As we discuss in detail below, the dramatic divergence between patterns of investment in commercial buildings and other structures raises the suspicion that despite their identical depreciation schedules the tax system affects them very differently.

We resist the temptation to analyze closely the evolution of investment in different types of assets over the last few years because of the problem stressed by Auerbach and Hines (1986) among others of gauging the effects of anticipated changes in tax policy. In 1984 and 1985 the depreciation incentives for investment in structures were reduced. In addition, rules limiting investors' ability to utilize structure investments as a tax shelter were introduced. More changes in the same direction are currently under discussion. It is at least conceivable that some of the strength in commercial building investment, and perhaps other types of investment as well, comes from a desire to accelerate investments so that they will receive favorable tax treatment. Given the common political view that real estate investments are a major tax shelter, it is possible that these effects are most important in the case of commercial buildings.

Table 7.2 also indicates that residential investment has been surprisingly strong over the last five years. The dollar volume of residential investment has increased by more than 50% over the past 5 years, and real investment in residential structures has increased by 26%, the same rate of growth exhibited by equipment investment. Virtually all of the real growth in residential investment is attributable to owner-occupied housing, which has risen 57% despite the fact that alone among structures it received no new tax incentives in 1981. Hendershott (1986) provides some evidence suggesting that at the same time that residential investment has been strong the homeownership rate has increased substantially.

The patterns of structure investment documented in this section suggest that conventional analyses of the effects of taxation may be seriously misleading. Such analyses do not distinguish between tax effects on different types of nonresidential structures and so cannot account for the great strength of commercial building investment relative to other types of structure investment. Many conventional analyses emphasize an alleged tax bias toward owner-occupied housing. These analyses cannot account for the observation that owner-occupied housing investment rose more rapidly than that of any other major category following the 1981 tax change which conferred substantial depreciation benefits on rental housing. These apparent anomalies may just reflect nontax factors which exert a substantial influence on investment. Alternatively, it is possible that important aspects of the effects of the tax system on structures have been neglected. We consider the latter possibility below.

7.2 Tax Churning of Nonresidential Real Property

As is now well understood, the present value of the depreciation allowances permitted on a capital asset has an important impact on the incentive to invest in it. Indeed, differences in the treatment of depreciation between assets is often regarded as a major source of nonneutrality in the tax system. Unfortunately, calculation of the present value of the depreciation allowances on a given capital asset is not straightforward because of the possibility of the assets being transferred and depreciated more than once for tax purposes. Particularly in an inflationary environment, there may be large advantages to turning assets over so their depreciable bases will be increased. Even with no inflation, asset sales raise the value of prospective depreciation allowances as long as depreciation allowances are more accelerated than economic depreciation. However, the incentive to churn assets is mitigated by the capital gains taxes and recapture taxes which must be paid when depreciable assets are sold.

This section examines the effects on investment incentives of the possibility that assets can be depreciated more than once.[1] After a review of the legal treatment of depreciation allowances and recapture, we analyze the desirability of churning different classes of assets. We find that the incentive to churn and the related incentive to invest is rather sensitive to both tax rates and assumed discount rates.

7.2.1 Depreciation and Recapture Rules

The Economic Recovery Tax Act of 1981 established shorter and faster write-offs of capital costs for new investment in equipment and structures. The accelerated cost recovery system (ACRS) included a provision for depreciation of most classes of structures by a 175% declining balance method over 15 years. ACRS replaced the asset depreciation range (ADR) system, which was by comparison far less generous in its treatment of capital depreciation allowances.

The ACRS significantly reduced corporations' costs of investing in structures and equipment. Other than the named goal of economic recovery, one of the purposes of the law was to rectify the effect of rising inflation on incentives to invest. Since the favorable depreciation provisions were designed to undo by themselves the effects of inflation, the law contained features which made it more costly than before to sell assets in order to permit the purchaser to get depreciation allowances on the higher, inflated basis.

The 1981 tax law permits investors to choose from a variety of options for depreciating most classes of real property. Besides using 175% declining balance with switch-over to straight-line over an asset life of 15 years, investors could select a straight-line depreciation method for an asset life of 15, 35, or 45 years as they chose. Under normal business circumstances, of course, an investor who planned never to sell his assets would always choose the shortest and most accelerated depreciation method.[2] However, the recapture provisions of the law depend on the chosen method of asset depreciation.

For investors who choose straight-line depreciation and who sell their assets, the difference between the sales price and the tax basis is treated as a capital gain and is taxed at the capital gain rate. However, for investors in nonresidential structures who choose the 175% declining balance depreciation scheme and who sell their assets at a gain, the value of all depreciation allowances taken to date are recaptured as ordinary income (rather than as capital gains). This recapture of all past depreciation deductions is normally sufficiently costly that an investor would be better off using straight-line depreciation if he intended to sell the asset at any point.

Congress has modified the tax treatment of structures since passage of the 1981 act, although not substantially. The 1984 Deficit Reduction Act (DEFRA) lengthened the tax life of most structures to 18 years and changed slightly the tax treatment of installment sales. Structures' tax life was further extended to 19 years in 1985. Depreciation and recapture provisions were otherwise unaffected by these laws.[3]

7.2.2 Evaluating the Incentive to Churn

The feasibility of churning an asset depends on its characteristics. A specialized industrial structure is likely to be difficult to sell because its functional specificity limits the range of potential buyers. And it may be difficult to sell and lease back because of the moral hazard and other problems associated with rental contracts. Most commercial real estate, on the other hand, is not highly specialized and is therefore easily leased. Indeed Pan Am rents space in the Pan Am Building and Exxon rents its space in Rockefeller Center. A natural conjecture then is that if the tax benefits of churning are substantial, a significant tax distortion may be created in favor of liquid assets. We explore this possibility by considering the magnitude of the tax incentive for the churning of commercial buildings.

Consider an investor, corporate or noncorporate, which invests in a commercial building in 1985, expecting the tax law, inflation, and the interest rate not to change in the future. There are three possible depreciation strategies that must be considered. First, the investor can use accelerated depreciation (with straight-line switch-over) and never churn the asset. Second, the investor can use accelerated depreciation and churn at the optimal point. Third, the firm can use straight-line depreciation and churn at the optimal point. We consider the attractiveness of each of these alternatives in turn.

Depreciation allowances can be easily calculated for scenarios in which firms do not churn their assets. For the current 19-year tax lifetime, it is optimal for firms to use 175% declining balance for the first 10 years of asset life, switching to straight-line depreciation thereafter. The value to the firm of these allowances is:

$$PV = \tau \sum_{j=1}^{19} D_a(j) \cdot [1 + i(1 - \tau)]^{-j}, \tag{1}$$

where $D_a(j)$ is the depreciation allowance in the jth year using ACRS acceleration and i is the required nominal before-tax rate of return.[4] Here τ is the investor's ordinary tax rate, and so equals 46% for a corporation and can be as high as 50% for an individual.

If instead the firm chooses the second option of depreciating its structure using the straight-line method and selling the asset after k years, then the present value of the firm's depreciation allowances minus capital gains liability is:

$$NET(k) = \tau \sum_{j=1}^{k} D_s(j)[1 + i(1 - \tau)]^{-j} - CG\{Q(k) - [1 - \sum_{j=1}^{k} D_s(j)]\}[1 + i(1 - \tau)]^{-k}, \tag{2}$$

where $D_s(j)$ is the straight-line depreciation allowance in the jth year and $Q(k)$ is the market value of the asset after k years. In this case, $D_s(j) = 1/19$ for all j. CG in (2) is the capital gains rate, which normally equals 28% for a corporation and is at most 20% for an individual. With the further assumption that structures depreciate exponentially at an annual rate δ, $Q(k)$ simplifies to:

$$Q(k) = [(1 - \delta)(1 + \pi)]^k, \tag{3}$$

where π is the inflation rate. To calculate the tax benefits from churning, assume that k represents the optimal choice of waiting time between asset purchase and sale. Then the second-round optimal tax treatment of the used asset will also include churning after k more years. Assume for simplicity that the firm sells the asset to itself at a market price, incurring a transaction cost in the process. Then the present value of all net depreciation benefits minus costs is:

$$PV = \sum_{j=0}^{\infty} \{NET(k) - TC \cdot Q(k)[1 + i(1 - \tau)]^{-k}\} \cdot \{[(1 + \pi)(1 - \delta)]/[1 + i(1 - \tau)]\}^{kj}, \tag{4}$$

where TC is the fraction of sales price the firm pays as a transaction cost. This expression simplifies to:

$$PV = \{NET_s(k) - TC \cdot Q(k)[1 + i(1 - \tau)]^{-k}\}/\{1 - [(1 + \pi)(1 - \delta)/(1 + i(1 - \tau))]^k\}. \tag{5}$$

The third option the firm faces is somewhat more complicated. Assuming that the rate of inflation exceeds the asset's exponential depreciation rate, so that the seller realizes a capital gain over purchase price, net depreciation benefits after churning in the kth year are:

$$NET_a = \tau\sum_{j=1}^{k} D_a(j)[1 + i(1 - \tau)]^{-j} - \{CG[Q(k) - 1] + \tau \sum_{j=1}^{k} D_a(j)\}[1 + i(1 - \tau)]^{-k}. \quad (6)$$

The potential tax benefits of churning are sensitive to the choice of capital gains tax rate. Previous calculations of the tax effects of asset sales have assumed that capital gains are all taxed upon realization at the statutory rate. Particularly for individuals but to some extent for corporations as well there are devices available which permit capital gains taxes to be avoided or deferred. This makes the churning of assets much more attractive. The features of the tax system that permit capital gains taxes to be avoided or reduced in present value include installment sales, variations in marginal tax rates, artificially generated losses, steps up in basis, and outright cheating.

The main device that both corporations and individuals can use to defer capital gains taxes is the installment sale. Rules governing installment sales were actually liberalized in 1980 but have been tightened more recently.[5] In an installment sale the seller accepts a sequence of installment payments for his property. The buyer is permitted to use the present value of these payments, the sale price, as his depreciation basis. However the seller must pay capital gains tax on the principal component of installment payments only as they are received. The net effect is to defer the seller's capital gains tax liability. The advantage can be quite substantial since at current interest rates deferral for 7 years halves a tax liability. The advantage is magnified if for some reason the seller's tax rate is expected to decline. While the installment sale is a commonly discussed tax avoidance device, we are not aware of quantitative information on the frequency of its use.

For individuals with temporarily low income or corporations with negative or very small taxable profits, progressivity of the tax code makes the effective marginal capital gains tax rate lower than its normal (statutory) value. Since taxpayers have some freedom to realize capital gains during advantageous (low tax rate) years, there is an option value attached to an anticipated future capital gains liability that reduces the effective rate. The results of Auerbach and Poterba (1986) suggest that this may be more important for individuals than corporations.

The possibilities for avoiding capital gains taxes are broadened considerably when the possibility of generating artificial losses is recognized. Stiglitz (1983) among others has discussed a variety of tax-timing strategies that allow taxpayers to generate capital losses without taking on substantial risks.[6] The law limits the ability of individuals and corporations to deduct capital losses against ordinary income. To the extent that these limits bind, the marginal tax rate on additional capital gains income is zero. Poterba (1986) presents evidence suggesting that about 20% of household dividends were received by taxpayers for whom marginal capital gains were untaxed because they were in this situation. It seems plausible that the fraction is higher for the sophisticated investors who hold commercial real estate.

The tax code provides for a tax-free step up in the basis on an asset if the taxpayer dies and bequeaths the asset or if the asset is given to charity. To the extent that taxpayers anticipate that they may die in the period in which they plan to hold an asset, the expected tax rate is reduced. The step up in basis on some kinds of charitable gifts means that individuals who plan to donate to charity an amount greater than their capital gains income can avoid capital gains taxes entirely. These two provisions mean that even naive and honest taxpayers can avoid capital gains tax burdens.

Finally there is the possibility of failing to report capital gains. Overall, Poterba estimates that about 40% of capital gains are not reported. This figure refers to capital gains on all types of assets. Unfortunately, separate figures are not available for real estate.[7]

The combination of these factors suggests that capital gains arising when structure investments are churned are effectively taxed at much less than the statutory rate. We therefore consider also the incentives for churning that arise when individuals' capital gains are completely untaxed and when they are taxed at half the statutory rate, as well as corporations' incentives when their capital gains are taxed at half and three-quarters the statutory rate.

7.2.3 Results

Table 7.3 reports values of net before-tax corporate depreciation allowances and effective tax rates for representative parameter values. These calculations employ the 2.47% annual exponential depreciation rate Hulten and Wykoff (1981) report for commercial structures and assume that transaction costs when assets are sold equal 5% of the sales price. The table presents results with required rates of return of 2% and 4%. As Summers (chap. 9) argues, these rates are if anything higher than those suggested by theory but are rather lower than those actually used by corporations. The 4% figure is standard in the effective tax rate literature.

For the churning scenarios it is assumed that the firm chooses the depreciation method and interval between asset sales so as to maximize

Table 7.3 Depreciation Benefits and Effective Tax Rates for Corporations

	Depreciation Method			
		Churning: Effective Capital Gains Rate		
Inflation Rate	Accelerated Depreciation	0.14	0.21	0.28
	Required Rate of Return = 0.02			
3%	0.69	0.81	0.71	0.59
	(37%)	(26%)	(36%)	(44%)
6%	0.58	0.60	0.48	0.36
	(44%)	(43%)	(50%)	(55%)
10%	0.47	0.41	0.33	0.24
	(50%)	(53%)	(58%)	(59%)
	Required Rate of Return = 0.04			
3%	0.61	0.62	0.55	0.48
	(35%)	(35%)	(38%)	(42%)
6%	0.58	0.47	0.40	0.36
	(37%)	(42%)	(45%)	(47%)
10%	0.43	0.38	0.33	0.27
	(44%)	(46%)	(48%)	(50%)

Note: Top entry is the present value of depreciation benefits; bottom entry in parentheses is the corresponding effective tax rate.

profits. As this table makes clear, under current law corporations will seldom want to churn structures for tax reasons. This is hardly surprising, since the recapture provisions of the tax law were designed to prevent such transactions. If the marginal corporate investor faces less than the statutory capital gains rate, then it may become slightly preferrable to churn its structures.

Table 7.4 presents similar calculations for top-bracket individuals who invest in structures through such devices as partnerships or proprietorships. As the table suggests, individuals have much stronger incentives to churn structures than do corporations. The top individual tax rate for ordinary income is 50%, and the top capital gains rate is 20%. Even ignoring the likely ability of individuals to avoid more of their capital gains liability than corporations can theirs, the 30% spread between the ordinary income and statutory capital gains rate is a much stronger churning incentive than the 18% spread faced by corporations.

At a 3% rate of inflation and 2% required rate of return individuals always choose to churn their assets, and if they can avoid capital gains taxes, may face negative effective tax rates. Even at higher inflation rates churning is a tax-preferred activity for individuals. Whether at a particular inflation rate corporations or individuals face higher effective

Table 7.4 Depreciation Benefits and Effective Tax Rates for Individuals

	Depreciation Method			
		Churning: Effective Capital Gains Rate		
Inflation Rate	Accelerated Depreciation	0.00	0.10	0.20
	Required Rate of Return = 0.02			
3%	0.69	1.06	0.90	0.75
	(41%)	(−14%)	(18%)	(35%)
6%	0.58	0.85	0.68	0.53
	(48%)	(26%)	(42%)	(51%)
10%	0.47	0.69	0.48	0.36
	(54%)	(41%)	(54%)	(59%)
	Required Rate of Return = 0.04			
3%	0.61	0.75	0.66	0.57
	(38%)	(29%)	(35%)	(41%)
6%	0.52	0.61	0.52	0.43
	(44%)	(39%)	(44%)	(48%)
10%	0.43	0.50	0.41	0.34
	(48%)	(45%)	(49%)	(51%)

Note: Top entry is the present value of depreciation benefits; bottom entry in parentheses is the corresponding effective tax rate.

tax rates may depend on their marginal capital gains rates. The source of funds matters as well, since the double taxation of corporate earnings may make the required corporate rate of return for new savings capital substantially higher than the rate for, say, partnership investors. Section 7.3 treats this issue in more depth, but it is sufficient at this point to note that individuals may face strong incentives to invest in structures and sell them later.[8] In particular, these results suggest that the tax code favors individual rather than corporate ownership of structures.

The preceding analysis is subject to two qualifications. Our calculations understate the potential importance of the resale of assets because they ignore the option value associated with uncertainty in asset values. If an asset appreciates rapidly, there will be tax advantages to turning it over. For a careful treatment of tax churning in a model where depreciation is stochastic, see Williams (1981). He finds that introducing uncertainty significantly increases the effect of the churning on the effective purchase price of new capital goods. For example, parameter values which most closely approximate the current tax treatment of structures produce the following result: doubling the variance of future asset prices raises the expected present value of depreciation allowances by about 15%.[9] Uncertainty in the tax law and the possibility of favorable future tax law changes may contribute to this effect. The second qualification is that our results may overstate the gains from churning by ignoring the capital gains taxes which often must be paid on land sales that accompany the transfer of structures. It is not clear to what degree these two qualifications offset each other.

7.2.4 The Extent of Churning

The limited available empirical evidence suggests that churning is an important part of the depreciation strategy for investors in structures.[10] Table 7.5 presents data on the depreciation methods chosen by corporations and partnerships for their structure investments in 1981 and 1982. Corporations used straight-line depreciation for 38% of the value of their structure investments in 1981 and for 33% in 1982. Except in

Table 7.5 Choice of Depreciation Method under ACRS (millions of current dollars)

	1981	1982
Corporations		
Total allocable 15-year real property other than low-income housing and public utility property	24.836	25.276
Accelerated depreciation	15.474	16.923
(%)	(62.3%)	(67.0%)
Straight-line	9.362	8.353
(%)	(37.7%)	(33.0%)
Unallocable property. foreign property. and tax-exempt organizations	6.171	5.294
Partnerships		
Total allocable 15-year real property other than low-income housing and public utility property	29.044	46.553
Accelerated depreciation	11.700	18.344
(%)	(40.3%)	(39.4%)
Straight-line	17.344	28.209
(%)	(59.7%)	(60.6%)
Unallocable property. foreign property. and tax-exempt organizations	1.879	1.492

Source: Unpublished preliminary data. Statistics of Income Division. Internal Revenue Service.

Note: Entries correspond to dollar values of 15-year real property (other than low-income housing and public utility structures) put in place and depreciated by the indicated method in these years. Unallocable property could not reliably be assigned to either the accelerated or straight-line depreciation category. These data exclude investments for which the IRS was unable to determine from the tax form which type of capital was being depreciated.

very unusual circumstances, use of straight-line depreciation makes sense only when firms plan to sell their assets at some date. In addition, under the generous pre-1984 recapture rules for installment sales, some firms may have used accelerated depreciation even if they wanted to churn their assets later. By such extensive use of straight-line depreciation, the corporate sector gives up the substantial tax benefits of acceleration in order, presumably, to avoid costly recapture when the structures are sold later.[11]

The bottom panel of table 7.5 presents far more striking information on partnerships. Fully 60% of the value of structures put in place by partnerships since the introduction of ACRS was depreciated straight-line. This is, of course, quite consistent with our findings that churning can be very attractive for individual investors and that individuals are more likely than corporations to take advantage of churning possibilities. The 60% figure in table 7.5 is likely to understate the extent of straight-line use for nonresidential investment, since the entry includes residential investment other than low-income housing. The absence of a special recapture penalty makes it very likely that partnerships use accelerated depreciation for their residential investments, so the fraction of nonresidential structures depreciated straight-line is probably well above 60%. While the data on partnership and corporate depreciation methods are preliminary and subject to reporting error, it seems clear that they support the hypothesis that investors often plan to sell their assets. At the very least, this information casts doubt on the relevance of standard effective tax rate calculations that assume all investors use accelerated depreciation methods.

The results in this section suggest that taking account of the possibility of tax churning may help to explain the recent boom in commercial building. If individuals use low discount rates and can avoid capital gains taxes, the tax burden on commercial structures may now be small or even negative. This reflects both the 1981 tax reforms and the reduction in inflation since 1980. It probably represents a substantial reduction in the tax burden from the situation that prevailed prior to 1981.

7.3 Corporate Financial Policy and the Effective Tax Rates on Structures Investment

Our analysis so far has concerned features of the tax treatment of investments in structures which are common to individual investors, partnerships, and corporations. The conventional wisdom that current tax law favors equipment over structures is derived from studies which have focused on corporate investment rather than overall investment.[12] The calculations underlying these claims are almost always based on a variant of the formula for the user cost of capital derived by Hall and Jorgenson (1967). This formula, however, ignores a variety of factors, among them personal taxes and corporate financial policy. In this section, we argue that when the effects of personal taxes and corporate financial policy are taken into account, there is a much smaller difference between the calculated effective tax rates on structures and equipment, and perhaps even a tax advantage to investments in structures.

The intuitive point is very simple. The tax law seems to treat debt-financed investments more favorably. Therefore, to the degree that a project can be financed with debt, it becomes more attractive. Investments in structures should be much more easily financed with debt than investments in equipment. Structures are easily used as collateral for a loan, there is a dense secondary market for most types of buildings that a creditor can go to if the collateral must be liquidated, and the market value of a building used as collateral is normally much more predictable than the values of many other assets. A firm should therefore be able to obtain a much larger loan on a building than on many other assets without imposing any effective default risk on the lender.[13]

The difficulty with examining the implications of the tax incentive to use debt is that there is no consensus in the literature concerning the determinants of corporate debt-equity ratios. Most of this section will focus on what we will call the traditional model of debt-equity decisions, though we will explore at the end the implications of some alternative models.

7.3.1 The Incentive to Use Debt Finance

In this traditional model, corporations have at the margin a tax incentive to favor debt finance. Income accruing within a corporation is taxed at a higher rate than income accruing directly to shareholders. Corporate income is taxable both under the corporate tax and again, either as dividends or as capital gains, under the shareholders' personal income tax, while income accruing directly to shareholders is taxable only under the personal tax. This difference in tax rates creates an opportunity for tax arbitrage. A firm and its shareholders can shift taxable income from the firm to the shareholders simply by having the firm borrow from the shareholders, using the proceeds to repurchase equity from the shareholders. The direct effects of this transaction are to lower the taxable income of the corporation by the amount of the interest payments made on the debt and to raise the individuals' taxable income by this amount less the change in income from equity.

In spite of this tax incentive to use debt finance, firms do not use debt exclusively because the possibility of bankruptcy leads to conflicts of interest between debt and equity holders, with associated real costs.[14] These real costs could take the form of direct legal and administrative costs in bankruptcy, monitoring costs of lenders as they try to protect themselves, and agency costs created by the incentive on the firm to change its behavior to aid equity holders at the expense of bond holders.[15]

In deriving an explicit expression for the size of the tax incentive to use debt, it is important to take account of the degree to which the income that shareholders receive from equity takes the form of dividends rather than capital gains. While there is no convincing explanation for why firms pay dividends, we presume that shareholders prefer to have at least some of the return from equity take the form of dividends, perhaps for liquidity reasons or perhaps because of the signal conveyed about the solvency of the firm. Our approach to dividends is very similar to that of Poterba and Summers (1985).

Except for the changes described above, we continue to follow the approach developed by Hall and Jorgenson (1967). When will an investment just break even? Assume that the value of the marginal product of the investment equals ρ and that the asset depreciates exponentially at a rate δ. The construction cost of the project is q. However, the out-of-pocket cost of the project to the firm is only $q(1 - k - uz)$, where k is the investment tax credit rate, u is the corporate tax rate, and z represents the present value of the depreciation deductions allowed under the tax law. We assume that the firm finances this amount by borrowing $bq(1 - k - uz)$, raising the rest of the funds from equity holders. Let i represent the nominal coupon rate on this debt, and let π represent the inflation rate. By using debt, the firm incurs some real costs due to the possibility of bankruptcy. Denote these real costs by $C(b)$. We assume that $C(0) = 0$, that $C' > 0$, and that these costs are deductible from taxable corporate income. Then the after-corporate-tax real return, R, to equity holders from this project, net of depreciation, will equal $R = [\rho - C(b)](1 - u) - q(1 - k - uz)\{\delta + b[i(1 - u) - \pi]\}$.

This real return is taxable under the personal income tax as either dividends or capital gains. Assume that a fraction p of this return is paid out as dividends and that the personal tax rate on dividends is m, while that on accruing capital gains is c. The effective tax rate, e, on the real return therefore equals $e = pm + (1 - p)c$.[16] Not only is the real return taxable, however, but the inflationary increase in nominal value is also taxable. We assume that this inflationary capital gain is taxable only at the capital gains tax rate. Shareholders therefore receive a net of personal tax return from this investment equal to $R(1 - e) - c\pi(1 - b)q(1 - k - uz)$. They receive this return on an initial investment of $(1 - b)q(1 - k - uz)$. Had they invested these funds in bonds instead, they could have received a net of tax return per dollar invested of $i(1 - m) - \pi$. However, due to the illiquidity of income received as capital gains rather than as coupon payments or dividends, they would require that their return on an investment in equity be higher by an amount $D(p)$, where we assume that $D(1) = 0$ and $D' < 0$.

Given these assumptions, shareholders are indifferent to the choice between investing in bonds or investing in this corporate project if

$$(7) \quad R(1 - e) - c\pi(1 - b)q(1 - k - uz) = (1 - b)q(1 - k - uz)[i(1 - m) - \pi + D].$$

This equation implicitly determines not only the required rate of return, ρ, on an investment project, but also the firm's optimal dividend payout rate, p^*, and optimal debt-value ratio, b^*. The firm would set b and p to minimize the required ρ^* that it must earn on capital. Simple algebra shows that the first-order conditions for the optimal b^* and p^* imply

$$(8) \quad C'(b^*) = (q(1 - k - uz)/[(1 - u)(1 - e)])\{i[u + e(1 - u) - m] - p(m - c)\pi + D\}.$$

$$(9) \quad -D'(p^*) = (m - c)[i(1 - m) - \pi(1 - c) + D]/(1 - e).$$

Equation (8) shows that the debt-equity ratio would be increased until the rise in bankruptcy costs from extra debt just equals the extra tax savings from further use of debt plus the gain from the greater liquidity of income from debt. Similarly, equation (9) shows that the dividend pay-out rate would be increased to the point where the tax loss from paying more dividends just equals the gain to the individual from the extra liquidity.

Given these values for b^* and p^*, equation (7) then implies that

$$(10) \quad \rho = C + q(1 - k - uz) \cdot \{(1 - b^*)[i(1 - m) - \pi(1 - c) + D] + (1 - e)(\delta + b^*[i(1 - u) - \pi]\}/[(1 - u)(1 - e)].$$

This equation corresponds to the expression for the user cost of capital in Hall and Jorgenson (1967), corrected for the effects of corporate financial decisions and personal taxes.

As long as the expression in braces in equation (10) is the same for all projects, conditional on the value of δ, these extra complications make little difference. The numerical value of this expression is difficult to estimate, even without the complications added here, and so past authors have chosen to assign some arbitrary value for the expression as a whole rather than to make an attempt to estimate each parameter.[17] However, to the extent that the optimal values of b^* or p^* differ by project, these differences ought to be taken into account when comparing the effects of the corporate tax on different types of investments.

There is every reason to expect the optimal value of b^* to vary by type of capital, for the reasons described above. It should also vary by industry, if only because the variability of the profits of a firm vary systematically by industry. Certainly the observed debt-value ratios differ substantially by industry. According to the figures reported in Fullerton and Gordon (1983) for the debt-value ratio in a select group of industries in 1973, the observed ratios ranged from 0.08 in construction to 0.787 in real estate. The average in the economy was 0.399.[18]

Unfortunately, there are no good data on the differing degrees to which debt is used to finance different types of capital within an industry. Auerbach (1985) attempted to explain differences in the debt-value ratios of different firms in part by differences in their use of structures versus equipment and found no systematic relation—coefficient estimates differed wildly across specifications. However, the use of structures versus equipment by industry can easily be correlated with other omitted factors which differ by industry and affect desired debt-value ratios. Given the lack of any good evidence on differences in the use of debt to finance different types of capital, the modest objective of this section is to demonstrate the importance of plausible differences in debt-value ratios for different projects to calculated effective tax rates for these different projects.

7.3.2 Effective Tax Rates

The effective tax rate, τ, on a project, as Auerbach (1983) defines it, would satisfy the equation

$$(11)\quad \rho_n = \rho^* - C - (1 - b)Dq(1 - k - uz) = q[(i(1 - m) - \pi)/(1 - \tau) + \delta].$$

In our context ρ_n is the value of the net marginal product, since a new investment generates incentive and agency costs due to the tax-induced incentive to favor debt and avoid dividends. Here $\tau = 0$ only if the value of the marginal return to new capital, net of depreciation, equals the individual's marginal time preference rate.

To indicate the potential importance of differences in debt-value ratios between assets, assume that we have calculated various effective tax rates assuming no differences in the use of debt finance. If, for example, the value of b for structures in fact exceeds that for equipment by 0.4, what effect does this have on the estimated tax rate? If τ_0 is the previously estimated effective tax rate on structures and τ_1 is the revised estimate, then it follows easily from equations (10) and (11) that

$$(12)\quad [i(1 - m) - \pi][1/(1 - \tau_0) - 1/(1 - \tau_1)] = 0.4(1 - k - uz)\{i[u(1 - e) - (1 - p)(m - c)] - p\pi(m - c) + D[u + e(1 - u)]\}/[(1 - u)(1 - e)].$$

In evaluating this expression, we attempt to follow the parameter assumptions made in Auerbach (1983) wherever possible. In particular, we assume that the initial estimate of the effective tax rate on structures is 0.421, as Auerbach calculated for 1982, that $u = 0.46$ and $k = 0$ by statute,[19] that $i(1 - m) = \pi + 0.04$, again as in Auerbach,[20] that $p = 0.4$, and that i equals the AAA corporate bond yield in 1982 of 0.138. We approximated z by 0.5.[21] For the personal tax rates m and c, we initially set $m = 0.35$ and $c = 0.05$.

Choosing a value for D is more arbitrary. However, equation (9) gives an equilibrium condition for D', and if we assume a functional form for D, we can calculate its value. We therefore assumed that $D(p) = a(1 - p)$, for some value a, implying that $D(p) = -(1 - p)D'$, with D' given by equation (9). This specification implies that in equilibrium the optimal dividend pay-out rate for any given firm is indeterminate, though the average pay-out rate for all firms together may be explicitly determined. We note below how our estimates change if we assume instead that $D(p) = a(1 - p)^2$, which leads to a unique optimal pay-out rate for each firm.

Given these parameter values, the new estimate of the effective tax rate on structures drops dramatically from 0.421 to 0.193. In contrast, the estimated effective tax rate on equipment reported by Auerbach for 1982 was 0.084. At least with these parameter values, the difference becomes minor. Given these parameter values, the calculated value of D equaled 0.0118, implying that a rather modest value of liquidity is sufficient to offset the tax disadvantage to dividends.

The key parameters in this calculation are the estimate of the difference in the value of b between equipment and structures, the estimates of m and c, and the value of the real after-tax interest rate. If, for example, the debt-value ratio for structures exceeds the value for equipment by only 0.3, then the effective tax rate on structures drops to only 0.265.

Similarly, let us maintain our previous assumption about the difference in the debt-value ratios, but now consider two alternative assumptions about the values of m and c. First, assume that $m = 0.46$ and $c = 0$.[22] With these values, the tax advantage to using debt is much reduced, since capital gains from equity are untaxed while interest income is taxed more heavily under the personal tax. Under these assumptions, the effective tax rate on structures drops to only 0.285. However, if we make the alternative assumption that $m = 0.225$, following the results in Gordon and Malkiel (1981), and set $c = 0.05$, then the effective tax rate on structures drops to 0.076.

Let us now return to our initial assumptions that the difference in the debt-value ratio used in funding structures and equipment is 0.4, and continue to assume that $m = 0.35$ and that $c = 0.05$, but assume that the real after-tax interest rate is only 0.03, changing the estimate of the inflation rate accordingly. With these assumptions, the effective tax rate on structures drops to 0.071.

Finally, if we again maintain our initial assumptions, but assume that the functional form for D is $D(p) = a(1 - p)^2$, implying a smaller value for D in equilibrium, then the effective tax rate on structures drops to only 0.232.

Therefore, at least using the traditional model of corporate financial decisions, differences in the optimal debt-value ratio for different types of capital can make a substantial difference when calculating effective tax rates. For most of the cases explored, the remaining difference in the effective tax rates on equipment and structures is minor and can be of either sign.

This traditional model of corporate financial decisions is far from the only one discussed seriously in the finance literature. For example, the papers by Miller (1977) and by DeAngelo and Masulis (1980) each argue, on different grounds, that firms may have increased their use of debt to the point where the tax advantage of using debt is eliminated. Miller considers the effect of the increased personal interest income on the marginal personal tax rate, while DeAngelo and Masulis consider the drop in corporate taxable income due to interest deductions on the marginal corporate tax rate. Under either model, differences in debt-value ratios by project have no impact on the effective tax rates on different projects. Each of these arguments depends critically on the marginal corporate or personal tax rate evolving enough before the debt-value ratio becomes so high as to lead to non-negligible agency or bankruptcy costs.

A quite different model of corporate financial policy was developed recently in Myers and Majluf (1984). They argue that when market investors see a firm issue new equity or new risky bonds, they will infer from this that the firm's managers view the current prices of equity or bonds as too high and are trying to take advantage of it. As a result, market prices fall when new securities are issued, and managers must take this into account when considering going to the market for new funds. They argue, as a result, that the firm will prefer to use internal sources of funds and will require a higher rate of return on a new project if it must raise the funds by issuing risky securities to outside investors.

Their argument does not consider the implications of the tax incentive to use debt finance. As long as bonds issued by the corporation remain riskless, then this favorable tax treatment would make debt finance cheaper than internal finance. If new debt issues are risky, then there is a trade-off between the tax advantage of new debt issues and the disadvantage of outside finance on which their model focuses. But the ability to finance a project with riskless bonds will vary by project, since projects differ in their suitability as collateral for a loan. If, as we argued above, structures make good collateral and can be financed heavily with debt before that debt becomes risky, then the required rate of return for structures should normally be lower than that for other projects, even ignoring tax effects, and would be lowered further by the tax advantage to debt finance. In this context, however, a simple comparison of effective tax rates is no longer sufficient to judge the effect of the tax law on the efficiency of the composition of the capital stock, since capital may be allocated inefficiently even without tax distortions.

The analysis in this section suggests that effective tax rate calculations are extremely sensitive to assumptions about marginal debt-equity ratios. To the extent that different types of capital assets have different abilities to carry debt, this means that standard calculations which assume constant (often zero) marginal debt-equity ratios are likely to be misleading. The vast disparities in debt-equity ratios across industries suggest that the error introduced by ignoring variations in the leverageability of assets is probably large. These results also help to resolve the empirical puzzle raised at the beginning of this chapter. Commercial buildings, especially office buildings, can probably carry much more debt than other more specialized structures. They may therefore be burdened much less by taxes than conventional analyses suggest.

7.4 Taxation and Tenure Choice

It is widely believed that the tax system favors owner-occupied housing. This conclusion is repeated in many textbooks and forms the basis for a significant amount of research on the effects of taxation on tenure choice. The standard argument is straightforward. The services of owner-occupied housing are untaxed while rental payments are treated as taxable income. While landlords are permitted tax deductions not permitted to homeowners, as long as there is some positive effective tax rate on rental income, homeownership is nonetheless thought to be tax-favored. As a number of authors including Litzenberger and Sosin (1977), Titman (1982), and Hendershott (1986) have recognized, there is an important defect in this argument. It ignores the possibility of tax arbitrage between high-bracket landlords and low-bracket tenants. High-bracket taxpayers have a comparative advantage over low-bracket taxpayers in making use of interest deductions which they can exploit by borrowing in order to buy real estate which they then rent to low-bracket taxpayers.

When this effect is recognized, it turns out that homeownership is tax-favored for only a very small number of taxpayers. In this section we demonstrate this conclusion by considering the effects of homeownership in a setting where people would be indifferent to the choice of owning and renting their homes but for tax incentives. In reality, of course, other considerations such as transaction costs, desire to own one's own place of residence, and the differing incentive effects of rental and ownership contracts influence tenure choice. But in order to study the incentives provided by the tax system, we abstract from these effects.

Before turning to a calculation of the tax incentive for different households to own their own home, it is useful to begin by illustrating the potential tax advantage of tenancy. The user cost of owner-occupied housing for a taxpayer in the t_p percent tax bracket is:

$$(13) \qquad c_o = (1 - t_p)(i + p_t) - \pi + n + \delta,$$

where c_o represents the user cost, i is the nominal interest rate, p_t is the property tax rate, π is the inflation rate, n represents maintenance costs expressed as a fraction of house value, and δ is the sum of the depreciation rate and risk premium.

Calculation of the cost of rental housing is more complex. We assume that competition forces rents down to the point where landlords earn the same risk-adjusted return on rental property as they could on bonds. This assumption is warranted as long as landlords can, at the margin, borrow or lend. It will become apparent that top-bracket landlords will be able to charge the lowest rents and so represent the marginal supplier of rental housing. The break-even condition for top-bracket landlords requires that:

$$(14) \qquad R = \frac{[(1 - t^*)i - \pi + \delta](1 - t^*z)}{(1 - t^*)} + p_t + n,$$

where t^* is the top-bracket tax rate, and z represents the present value of depreciation allowances permitted for tax purposes.[23] It follows that taxpayers will prefer to rent rather than own their homes as long as $c_o > R$, which occurs as long as the following condition is satisfied:

$$(15) \qquad t_p < \frac{t^*zi + [(\pi - \delta)t^*(1 - z)/(1 - t^*)]}{(i + p_t)}.$$

It is clear from (15) that if real after-tax interest rates are assumed to be positive, the break-even tax rate at which investors are just indifferent to owning their homes is an increasing function of z and of the top tax rate t^*. It is also an increasing function of the rate of inflation, assuming that the real interest rate remains constant. This is because increases in nominal interest raise the advantage to structuring transactions so as to allocate interest deductions to high-bracket taxpayers. These considerations suggest that the effects of the 1981 tax reform on tenure choice cannot be evaluated on an a priori basis. On the one hand, the introduction of ACRS tends to promote rental housing, while the reduction in the top tax rate from 70% to 50% tends to reduce the incentives for renting housing. Therefore, we turn to a quantitative calculation of the break-even tax rate under alternative tax regimes.

Under ACRS, residential property was permitted 175% declining-balance depreciation over a useful life of 15 years (now 19 years). In addition, residential property has the desirable feature that upon sale accelerated depreciation is recaptured at ordinary income rates only to the extent that it has exceeded straight-line depreciation. The 1981 act also permits purchasers of used assets to use the 175% declining-balance depreciation method. Prior to 1981, asset lives were substantially longer but investors in new residential structures were allowed 200% declining-balance (or sum-of-the-years-digits) depreciation. Purchasers of used assets were required to use 125% declining-balance depreciation, thereby lowering the prices of used structures relative to new structures and reducing the value of tax churning. High individual marginal tax rates provided ample incentive for investment in rental housing, however. The appendix describes the method used to determine the value of depreciation allowances with churning under pre-ACRS tax rules.

Table 7.6 presents values of marginal tax rates for individuals who were indifferent between homeownership and renting for the years 1965–85. To solve equation (15), we follow DeLeeuw and Ozanne (1979) in assuming that $\delta = 0.014$ and $p_t = 0.02$. In performing the user-cost calculations (7), we add a 0.04 premium to δ in order to adjust the cost of asset depreciation for risk. Individuals' expectations of future inflation are represented by a distributed lag on past inflation, and the before-tax interest rate is the historical Baa corporate bond rate. In each year owners of residential rental property are assumed to optimize over the choice of depreciation method and potential churning period.[24]

The results in table 7.6 describe four scenarios. We examine cases in which individuals who own rental housing avoid half their capital gains liability at the margin and also cases in which they pay the full statutory rate on capital gains. In addition, we report separately specifications in which investors treat depreciation allowances as risky (and so add 0.04 to the annual discount rate in calculating their present value) and in which they are viewed as riskless.

The striking implication of the findings reported in table 7.6 is that homeownership has not until recently been favored by the tax code.[25] High individual tax rates before 1982 encouraged most taxpayers to rent their dwellings from top-bracket individuals. While the results in table 7.6 reflect changing inflation and interest rates as well as statutory tax changes, it is hard to escape the conclusion that falling personal taxes have undone changes in the depreciation provisions to make

Table 7.6 Tenure Choice and Tax Status, 1965–85 (percentages)

		Minimum Tax Bracket for Owner-Occupiers			
		Full Capital Gains Liability		One-Half Capital Gains Liability	
Year	Maximum Personal Tax Bracket	Risky Returns	Riskless Returns	Risky Returns	Riskless Returns
1965	70	0	64	0	70+
1970	73	24	62	27	69
1975	70	59	59	59	59
1980	70	55	63	56	64
1981	69	53	56	53	56
1982	50	32	50+	41	50+
1983	50	28	50	38	50+
1984	50	19	34	37	44
1985	50	11	23	13	29

Note: Entries correspond to break-even tax rates for tenure choice. Taxpayers with lower marginal tax rates will be renters, and those with higher marginal rates will be owner-occupiers.

homeownership much more attractive in recent years. From this perspective, it is perhaps not surprising that homeownership and residential investment have been strong in recent years.

7.5 Conclusions

The analysis in this paper highlights the difficulty of predicting the effects of tax rules on the level and composition of investment. The incentives for investment provided by the tax law turn out to depend on a number of quite specific features of the law, rather than just on tax rates and depreciation schedules. They also depend on how the tax law interacts with the liquidity characteristics of different types of assets. Analyses that omit these factors are likely to have little predictive power for the effects of tax changes on the composition of investment. And normative conclusions based on models that omit them are likely to be very misleading.

Our findings imply that there are at most minimal allocative losses resulting from the differential treatment of equipment and structures under current depreciation schedules. There are substantial reasons to believe that residential and nonresidential real estate investments made by partnerships are substantially favored under current law, because of the tax advantages associated with churning assets, arbitrage between taxpayers in different brackets, and leverage. Movements to equalize effective tax rates on structure and equipment investments as these rates are normally measured would be likely to exacerbate these distortions.

Changes in the tax rules governing recapture, limited partnerships, and the use of nonrecourse debt have the potential for reducing the tax benefits accruing to investments in rental properties and commercial buildings. Alternatively the possible tax bias in favor of these assets could be mitigated by providing them with depreciation schedules different from those afforded other structure investments. More generally, the incentive to churn assets and the tax advantages of those assets which can be churned would be reduced if depreciation allowances were indexed for inflation rather than accelerated. Similarly, the tax advantages of debt-financed investments would be reduced if firms were permitted to deduct only real rather than nominal interest payments.

The conclusion that the tax system discriminates strongly in favor of rental housing and against owner-occupied housing raises important issues for subsequent research. Given tax incentives, some other explanation must be given for the predominance of homeownership. A natural candidate is the moral hazard problem associated with rental contracts. Tenants have little incentive to care for properties which they do not own. Landlords have strong incentives to deny tenants the right to alter properties in ways that tenants may prefer but which may ultimately reduce market value. These problems are solved when people rent from themselves as with owner-occupied housing. In the presence of moral hazard problems, the market is unlikely to attain an optimal solution even in the absence of taxes. The imposition of taxes which discourage home ownership may result in very substantial deadweight losses given the presence of pre-existing distortions.

A similar point applies to the question of debt-financed investments in structures. To the extent that there are important information problems bearing on types of capital which are not liquid, too little investment in these types of capital is likely to take place even in the absence of taxes. These biases may be exacerbated by tax rules which favor liquid investments. If so, the social costs of nonneutral taxation may be much greater than the losses associated with distortionary taxation in environments without preexisting distortions. Consideration of structure investments highlights the need for the development of models considering the effects of taxes in markets already distorted by information problems. It seems likely that the welfare consequences of the interaction of tax rules and information problems are likely to be far greater than those found in typical neutrality calculations. We plan to pursue these issues in future research.

Appendix
Calculation of Depreciation Allowances with Churning

This appendix describes the solution method used to evaluate the present value of depreciation allowances when firms or individuals churn their assets. The procedure is slightly more complicated than standard present-value calculations because the value of future tax benefits is a function of the prices of used assets, which are functions of those tax benefits, and so on. Consistency requires that anticipated prices of used assets take churning possibilities into account.

These calculations assume that investors expect inflation rates, interest rates, and the tax law not to change in the future. In addition, our results employ the assumption that assets depreciate at constant exponential rates. These assumptions are standard in the effective tax rate literature when computing the value of depreciation allowances. Hendershott and Ling (1984) assume a different, reverse-sum-of-the-years depreciation schedule, which permits a direct numerical evaluation of churning benefits. Assets that depreciate exponentially have no terminal dates, thus making it impossible to use the solution technique Hendershott and Ling describe to evaluate churning of these assets. Pellechio (1985) employs a solution method that can accommodate exponential depreciation but is different from the one used here.

Equations (2)–(6) in the text describe the value of depreciation allowances when firms churn their assets after k years. These equations include terms for $Q(k)$, the market price of a used asset k years after its initial purchase (the price of new capital in the first year is normalized to 1). Under the assumption that the tax treatment of old assets is the same as that accorded new assets, $Q(k)$ is as given in (3):

$$Q(k) = [(1 - \delta)(1 + \pi)]^k. \tag{16}$$

Unfortunately, this assumption of symmetric treatment of old and new assets is valid only under ACRS. Before the introduction of ACRS, used nonresidential structures had to be depreciated straight-line. Pre-ACRS residential structures were depreciated at declining balance rates of 200% when new and 125% when used. These features make old assets less valuable than (16) indicates. Of course, these rules do not change the *relative* prices of used assets of different ages, since their tax treatment if sold is identical; it will, for example, always be the case that

$$Q(k + n) = [(1 - \delta)(1 + \pi)]^n Q(k). \tag{17}$$

In calculating the present value of depreciation allowances, we used (17) and prevailing depreciation rules to solve numerically for the optimal treatment of used assets. Denote by z_{iu} the present value of all depreciation allowances (including those obtained after churning), net of transaction costs and capital gain taxes, for an investor in asset i when it is used. If z_{in} represents the present value of all (churning inclusive) depreciation allowances net of costs for a new asset, then it will be the case that:

$$Q(k) = [(1 - \delta_i)(1 + \pi)]^k (1 - \tau z_{in})/(1 - \tau z_{iu}). \tag{18}$$

Given the depreciation and recapture rules of equations (2)–(6), the maximized present value of depreciation benefits for a new asset which the investor plans to sell in year k will be:

$$z_{in} = \alpha_{ik} + \beta_{ik} Q(k) \tag{19}$$

where α_{ik} and β_{ik} depend on tax rules, inflation, depreciation rates, and other parameters. Substituting (17) into (18) produces

$$z_{in} = \{\alpha_{ik} + \beta_{ik}[(1 - \delta_i)(1 + \pi)]^k\}/ \{1 + \beta_{ik}\tau[(1 - \delta_i)(1 + \pi)]^k - \tau z_{iu}\} \tag{20}$$

The optimal churning program maximizes the value of z_{in} in (20), and we use that value of z_{in} for the calculations in the tables.

Notes

1. Hendershott and Ling (1984) and Pellechio (1985) have examined the incentives for churning assets. Our treatment generalizes their work by allowing for the important possibility that effective capital gains rates are below statutory rates. This accounts for our more positive view of churning as a device for reducing tax liabilities.

2. Limitations on loss carried forward may induce some small number of firms in special circumstances to choose the longer depreciation lives and the associated straight-line method. See Auerbach and Poterba (1986).

3. We do not consider the churning of equipment; however, in general it is never desirable to churn equipment for tax reasons alone. The investment tax credit (ITC) constitutes a substantial part of cost recovery for equipment investment, and the tax law includes harsh recapture provisions for the ITC upon early sale of equipment. Since used equipment is ineligible for the ITC, the combined effect is to make asset sales unattractive from a tax standpoint. Auerbach and Kotlikoff (1983) find that not even equipment put into place before the introduction of ACRS could be profitably churned after 1981.

4. The formula actually requires a minor correction for discounting of depreciation allowances within each year and the mid-month convention; the calculations in the tables embody these subtleties.

5. Tax changes in 1984 required that investors pay recapture taxes immediately upon sale of an asset, even if the buyer pays in installments. As Gilson, Scholes, and Wolfson (1986) illustrate, however, an installment sale can still significantly reduce the seller's effective capital gains tax rate.

6. Recent law changes have limited but by no means eliminated investors' abilities to use these strategies.

7. We are agnostic on the question of whether sophisticated real estate investors are more likely than other investors to underreport their gains. It may be particularly difficult to avoid declaring capital gains on an asset for which a taxpayer has received depreciation allowances for years.

8. Note that the incentive to churn is strongest at low inflation rates. Under current recapture rules, churning serves less to undo the effects of inflation than it does to exploit the difference between economic depreciation and tax depreciation.

9. This calculation comes from table 2 of Williams (1981) and assumes a 50% tax rate, 6% transactions cost for asset sales, capital gains taxed at 40% of the ordinary income rate, 10% interest rate, 3% annual risk-adjusted growth of asset prices, and a declining balance depreciation method which provides allowances equal to 9% of the basis each year. When, in this scenario, the annual variance of asset prices is 10% of value, the present value of depreciation allowances is .516; if the variance were 20%, the present value would be .599.

10. The ability to churn assets affects other aspects of firm strategy as well. Firms can sell assets as an alternative to using such devices as leases and takeovers in order to keep taxable status every year.

11. These fractions of depreciation taken using acceleration are substantially lower than fractions Wales (1966) reports for most industries in 1960. Running his learning functions forward to 1982 predicts rates of use of accelerated depreciation even more at variance with firms' practices, despite changes which have made accelerated depreciation more generous than before.

12. For a recent example, see Auerbach (1983).

13. Buildings are not unique in this regard. Our argument applies as well to any asset where there is a good secondary market and a relatively stable price. Other examples might include motor vehicles, airplanes, or mainframe computers. Most types of equipment, however, tend to be specialized to the activities of a particular firm and so have little value to a creditor if they are seized in lieu of repayment of the debt. Conversely, not all types of buildings are equally liquid or have an equally stable value. Office buildings, for example, are probably far more liquid than factory buildings.

14. For a recent exposition of this view, see Modigliani (1982) or Gordon (1982).

15. For an exposition on these points, see Gordon and Malkiel (1981), Myers (1977), Jensen and Meckling (1976), or White (1983).

16. In this section c refers to the effective capital gains tax rate on *accruing* gains rather than on realized gains as in the last section.

17. Hall and Jorgenson (1967) set this expression equal to $\delta + 0.1$. Auerbach (1983), while also deriving a related formula involving the effects of debt finance, set the resulting expression equal to $\delta + 0.4$.

18. These figures represent the average use of debt for all the capital in the firm and not necessarily the marginal debt-value ratio. However, there is no systematic reason in the above model why the desired value of b^* ought to change as a firm expands.

19. We ignore here the possibility that the firm may have taxable losses that cannot be carried back to previous tax years or at least carried forward and

used up quickly. For further discussion, see Auerbach (1983) and Auerbach and Poterba (1986).

20. Bradford and Fullerton (1981) demonstrated the sensitivity of estimated tax rates to this estimate of the individual's opportunity cost of funds. By following Auerbach (1983) in assuming such a high after-tax real interest rate, we reduce the effects of debt finance on the estimated effective tax rate.

21. See Summers (1986) for a discussion of the discounting of depreciation allowances.

22. In order to keep the real after-tax interest rate at 0.04, we adjust the estimate for the inflation rate as needed.

23. In deriving (14), we follow Bulow and Summers (1984) in assuming that the tax system does not share in the risks associated with owning structures.

24. Calculations for the pre-ACRS period ignore potential complications involving interactions of depreciation allowances and the maximum tax on earned income, as described by Hite and Sanders (1981). For our purposes it is enough to assume that for marginal investors the bulk of their income is unearned. In addition, these calculations ignore the cost of land and the capital gains tax liability that may be generated when a residence is churned and land is sold. We assume implicitly that owner-occupiers and renters rent the land for their residences at equal rates.

25. These results differ substantially from more standard calculations of authors such as Diamond (1980) and Hendershott and Shilling (1982) that find homeownership to have become progressively more attractive over the 1970s. Our model incorporates tax arbitrage and also differs from theirs in assuming that investors expect house prices to be in equilibrium, and therefore rising at the general rate of inflation.

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Comment Emil M. Sunley

Are equipment or structures more tax-favored? The capital recovery rules suggest that equipment is more tax-favored: the investment tax credit and 5-year ACRS depreciation together are about equivalent to expensing, and expensing results in a zero effective tax rate.[1] Buildings

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1. Assuming a 10% discount rate and discounting the first year's tax savings one-half year and the second year's tax savings one and one-half years, etc., the current capital recovery rules for equipment are about equivalent to expensing. That expensing is equivalent to a zero effective tax rate, see Musgrave (1959).

generally are not eligible for the investment tax credit and the allowable depreciation is not as accelerated as that for equipment. Therefore, the effective tax rate on investments in buildings must be higher than for investments in equipment, or so the argument goes.

It is also often alleged that homeownership is favored over renting because the homeowner is not taxed on imputed rental income and is allowed to deduct mortgage interest and property taxes in determining taxable income.

Gordon, Hines, and Summers explore three issues relating to the tax treatment of structures (1) the churning of depreciable buildings, (2) leverage, and (3) the tenure choice between homeownership and renting. They conclude that structures are not tax-disadvantaged and that until very recently homeownership has not been favored by the tax law.

Churning

Repeated sales of buildings may lead to significant tax advantages for investors and a corresponding drain on the Treasury. Gordon, Hines, and Summers set up a fairly straightforward model to measure the benefits from churning buildings. They conclude that if the gain on sale is taxed at full capital gains rate, it generally does not pay to churn. However, if the capital gains tax can be avoided or reduced, for example, through installment sales, churning can reduce the tax burden on buildings.

When a building is sold, according to Brannon and Sunley (1976), three things happen and two of them are bad. First, gain is recognized and this gain is taxed as ordinary income or capital gains depending on the recapture rules. This is a minus for the investors and a plus for the Treasury. Second, there is a step up of basis. The new owner gets to claim depreciation deductions based on the price paid for the building. This is a plus for the investors and a minus for the Treasury. Third, the depreciation allowed with respect to the seller's remaining basis in the building will be stretched out. For example, if the seller had continued to hold the building, the cost might be fully recovered over the next 10 years. The buyer will recover cost over the next 19 years. This is a minus for the investors and a plus for the Treasury.

The Gordon, Hines, and Summers model of churning captures most of the essentials of the question to sell or not to sell. Unlike Pellechio (1985), they do not make the selling price of the building a function of the tax treatment of the subsequent owners. Instead the market value of the building is assumed to decline at a constant annual rate. Also the model ignores the fact that land and buildings are usually sold together. Any gain on the land generates tax today but no depreciation deductions tomorrow. This is clearly a minus for the investors and can easily offset the other benefits from churning.

An alternative to selling a building is a like-kind exchange which for tax purposes does not result in recognition of any gain. Instead the gain is deferred until the building is later sold and gain is recognized. The taxpayer in a like-kind exchange carries over the basis from the first building to the second one. In short, no gain is recognized, the basis is not stepped up, and remaining basis continues to be written off as it would have been if no trade had taken place.[2]

Leverage

Increasing the amount of debt, with one exception, neither creates nor destroys income in the system. The interest paid on the debt is deductible by the payor and taxable to the recipient. The one exception is when a corporation increases its leverage because the double tax on corporate income may be avoided if the loanable funds are supplied by individuals.

Though increasing leverage does not destroy income in the system, there may still be significant tax advantages of debt if the borrowers are in higher tax brackets than the lenders. The tax savings from the interest deduction will exceed the tax paid on the interest income. Gordon, Hines, and Summers focus on the tax arbitrage between borrowers and lenders and build a model to suggest that buildings will be more heavily leveraged. Unfortunately, they present no evidence that buildings are, in fact, more heavily leveraged than other investments.

Renting versus Homeownership

The traditional view is that homeownership is favored because imputed rental income is not taxed and mortgage interest and property taxes are deductible. The tax benefits of homeownership increase with the marginal tax rate of the owner. Gordon, Hines, and Summers accept the traditional analysis of the tax benefits of homeownership but also consider the tax benefits associated with rental properties. These tax benefits may be passed through to tenants in the form of reduced rent.

The Gordon, Hines, and Summers model of the tax benefits of rental properties is similar to the one developed by Sunley (1970). Unlike Sunley, however, they assume that top-bracket landlords represent the marginal supplier of rental housing. This critical assumption is wrong.

2. This simplified description of a like-kind exchange assumes that both buildings are of equal value. Where "boot," that is, money or other nonqualifying property,—is transferred from one party to the other in order to equalize the contributions of each party, the taxpayer will recognize gain to the extent of any boot received. The transferred basis in the new property is decreased by any money received and increased by any gain recognized.

There are not enough top-bracket investors to hold all the depreciable rental estate. As lower-bracket investors are induced to hold real estate, the tax benefits that can be passed through to tenants will be reduced. This reasoning is similar to the argument that the yield differential between taxable and tax-exempt bonds depends on the tax bracket of the marginal investor in tax exempts. The yield differential must narrow to induce lower-bracket investors to hold tax exempts. If Gordon, Hines, and Summers had used a more reasonable tax rate for the marginal investor in rental housing, they would not have concluded that "homeownership has not until recently been favored by the tax code."

Their conclusion also appears to contradict the facts. According to Hendershott (chap. 8), in recent years the homeownership rate has increased only for the oldest married couples. For younger couples homeownership has declined. The rapid increase in homeownership rates occurred in just those years when renting, Gordon, Hines, and Summers concluded, was more tax-favored than homeownership.

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