# 6 INVESTMENT ALLOCATION AND GROWTH UNDER THE TAX REFORM ACT OF 1986

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## I. INTRODUCTION

Investment incentives and economic efficiency have been important issues in the debate preceding passage of the Tax Reform Act of 1986. The final version of tax reform changes the taxation of capital, and hence investment incentives, in several important ways. Cost recovery allowances are tightened as a result of longer lives for depreciation and repeal of the investment tax credit. At the same time, however, the corporate statutory rate has fallen from 46 percent to 34 percent. In addition, tax reform lowers individual tax rates on interest, dividends, and noncorporate income, but raises the rate on capital gains.

The paper by Fullerton, Gillette, and Mackie (1987, this volume) analyzes the effect of tax reform on investment incentives. Their cost of capital analysis suggests that overall investment and savings incentives might be reduced by tax reform. Thus tax reform could reduce capital formation and growth. At the same time, however, they point out that tax reform will improve the allocation of a given stock of capital. Thus, the net welfare effect of the capital taxation provisions of the Tax Reform Act of 1986 is ambiguous. It depends on the sensitivity of total investment to the overall net rate of return, as compared to the sensitivity of capital allocation to differential returns across assets. Analysis of the cost of capital by itself can only point out incentives for behavioral changes. It cannot assess the magnitudes of such changes.

Fullerton and Henderson (1986a) have developed a general equilibrium model that can analyze the effects of changes in investment incentives on savings, investment, allocation, output, and welfare. Their model incorporates the cost of capital model of Fullerton and Henderson (1984) into the general equilibrium model developed by Fullerton, Shoven, and Whalley (1978, 1983).

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As a consequence, the Fullerton-Henderson general equilibrium model facilitates analysis of the tax-induced welfare effects of changes in interasset, intersectoral, and intertemporal distortions of the type associated with tax reform.

Fullerton and Henderson (1986b) have used their disaggregate general equilibrium model to evaluate the capital taxation provisions of the Treasury proposal of 1984 and the President's proposal of 1985. We use this model to analyze the Tax Reform Act of 1986. We find that tax reform improves welfare under a wide variety of assumptions concerning the relative importance of interasset, intersectoral, and intertemporal effects. Thus, the reform-induced reduction of interasset distortions generally offsets the effects of increases in intersectoral and intertemporal distortions. Only when saving is very sensitive to the net rate of return, or when investment allocation is very insensitive to differential asset taxation, does tax reform fail to stimulate improvements in output and welfare.

The paper is organized as follows. In section I we measure the impact of tax reform on investment incentives using a cost of capital model. In section II we describe the general equilibrium model of Fullerton and Henderson in more detail. Section III presents our simulation results. We conclude in section IV with a summary of our findings.

## II. THE EFFECT OF TAX LAW ON INCENTIVES

The Tax Reform Act of 1986 incorporates pervasive changes to the tax code, but this paper concentrates on provisions that would affect taxes on income from capital. These include the reduction of the top corporate rate from 46 to 34 percent and the reduction of personal rates to two brackets of 15 and 28 percent[1], as well as revised capital cost recovery provisions, including the repeal of the investment tax credit.

This section measures the investment incentives arising from these changes and compares them to incentives under prior law. The model of investment incentives is based on Fullerton and Henderson (1984), as updated in Henderson (1986) and Fullerton (1987). In order to use these costs of capital as inputs for the general equilibrium model, we omit the further disaggregation of capital stocks and other refinements of Fullerton, Gillette, and Mackie (1987, this volume).

### A. A Model of Investment Incentives

We measure investment incentives using the cost of capital approach of Hall and Jorgensen (1967). Consider a perfectly competitive corporate firm contemplating a new investment in a world with no uncertainty. Assume the firm has sufficient tax liability to take associated credits and deductions, and that it does not resell the asset.[2] Investment receives a tax credit at rate k. The rental return increases at the constant inflation rate $\pi$, and decreases because of constant exponential depreciation of the asset at rate $\delta$. Local property tax at rate w is paid on the asset's value at any point in time, and the return net of property tax is subject to the corporate income tax at statutory rate u. These net returns are discounted at the firm's nominal after-tax discount rate r. The present value of depreciation allowances per dollar of marginal investment is z.[3] In equilibrium, the real social return in the corporate sector, gross of tax but net of depreciation, $\rho^c$, may be written as:

$$\rho^c = \frac{r-\pi+\delta}{1-u}(1-k-uz) + w - \delta \ . \tag{6.1}$$

In calculations below, common values are used for r, $\pi$, and u, but each asset has a specific value for $\delta$, k, z, and w. Similar expressions may be derived for the real social return in the noncorporate business sector and owner-occupied housing sector. See Fullerton, Gillette, and Mackie (1987, this volume).[4]

To compute the discount rate, we assume that individuals hold debt and equity issued by all three sectors, and that they arbitrage away any differences in net rates of return.[5] Suppose i is the nominal interest rate and $\tau_d$ is the debtholder's personal marginal tax rate. Then, under our arbitrage assumption, all assets must provide the real net return that individuals could earn on their debt holdings:

$$s = i(1-\tau_d)-\pi \ . \tag{6.2}$$

Here, s represents the net-of-all-tax return in the corporate, noncorporate, and owner-occupied housing sectors. In our computations, we start with an assumption on s and use equation (6.2) to calculate i for all sectors as $(s+\pi)/(1-\tau_d)$.

The computation of discount rates then involves examining separately each sector and source of finance–debt, retained earnings, and new share issues–assuming that the financial decision is exogenous. We focus our discussion on the corporate sector, but similar expressions are derived for the noncorporate business and owner-occupied housing sectors. The corporation's discount rate for debt is simply the rate of return net of corporate income tax: $r = i(1-u)$. For retained earnings, the individual's nominal net return must match $i(1-\tau_d)$. The investment earns a nominal net-of-corporate-tax return r and the resulting share appreciation is taxed at the accrued personal capital gains rate $\tau_{re}$. The return r must be such that $r(1-\tau_{re}) = i(1-\tau_d)$. The solution for r provides the requisite discount rate. Finally, new shares provide a return net of corporate taxes that can be paid as dividends and taxed at personal rate $\tau_{ns}$, so $r(1-\tau_{ns}) = i(1-\tau_d)$. The corporation's single discount rate is a weighted average of these three discount rates:

$$c_d \left[ i(1-u) \right] + c_{re} \left[ \frac{i(1-\tau_d)}{(1-\tau_{re})} \right] + c_{ns} \left[ \frac{i(1-\tau_d)}{(1-\tau_{ns})} \right] \qquad (6.3)$$

where $c_d$, $c_{re}$, and $c_{ns}$ are the proportions of new investment financed by debt, retained earnings, and new shares, respectively.[6]

Investment incentives are properly measured by the marginal product of capital, $\rho$, but we present many of our results in terms of marginal effective total tax rates. These tax rates (t) are the difference between the pre- and post-tax rates of return, as a proportion of the pre-tax rate of return. Because s is the return net of all taxes, this effective rate reflects the combined impact of corporate taxes, property taxes, and personal taxes. It shows the portion of capital costs attributable to taxes.[7] The reason for looking at effective tax rates is that they are easily interpreted. For example, the effective rate can be compared with the statutory corporate rate, or with the zero rate that would apply in the case of a consumption tax. With s constant throughout the economy, t varies with $\rho$ in such a way that assets, industries, or sectors with higher effective tax rates also face higher required pre-tax rates of return for investment.

## B. The Two Tax Regimes

The above framework is useful to sort out the net impact of statutory tax rates, cost recovery provisions, and other rules affecting interest, dividends, and capital gains. This section proceeds to discuss values for the parameters necessary to implement that framework, for prior law and for the Tax Reform Act of 1986.

### 1. Statutory tax rates

For prior law, we use the top federal statutory rate of .46 for marginal corporate income. The weighted average of states' top-bracket rates has been estimated to be .0655 by King and Fullerton (1984, p. 204). Accounting for the deductibility of state taxes at the federal level, the appropriate value for u is .46+.0655(1-.46), which equals 49.5 percent. Tax reform sets a top federal rate of .34 and maintains the deductibility of state corporate taxes. For this reform, u is thus 38.3 percent.

We also require marginal tax rates at the personal level. To measure corporate investment incentives, we need marginal rates on dividend income ($\tau_{ns}$) and capital gains ($\tau_{re}$). For noncorporate business, we require a marginal rate on entrepreneurial income ($\tau_{nc}$), which enters the noncorporate cost of capital in a manner analogous to the effect of u on the corporate cost of capital. Similarly, we require a rate for interest and property tax deductions of home-owners ($\tau_h$) in order to measure incentives for investment in owner-occupied housing. Finally, to include the effect of debt finance, we need a marginal tax rate for interest income ($\tau_d$).

The marginal investment under consideration is an equiproportionate increase in all capital stocks, with an equiproportionate increase in the holdings of all investors. Additional debt and interest income, for example, would be distributed among debtholders in proportion to their current debt and interest income. The appropriate marginal tax rate is thus the average of all debtholders' marginal rates, weighted by their interest income. We include both federal and state taxes. Furthermore, these rates must reflect the proportions of income received directly by households and the proportions received indirectly through institutions such as nonprofit organizations and life insurance companies.

For households, federal tax rates were calculated by James Cilke using the Treasury Individual Tax Model.[8] The computed rate for housing interest deductions under prior law is 20.9 percent. The rate for interest recipients (25.5 percent) and rate for dividend recipients (32.9 percent) indicate that they are on average in higher brackets than homeowners. The 41.0 percent capital gains rate reflects the full taxation of realized gains, and the 25.0 percent noncorporate rate reflects the low brackets of many proprietors and partners with losses for tax purposes. All of these personal tax rates would be reduced by tax reform. The newly calculated marginal rates are: housing deductions, 17.5 percent; interest received, 21.6 percent; dividends, 25.8 percent; capital gains, 26.7 percent; and noncorporate income, 21.0 percent.

In order to include state income taxes, 5 percentage points are added to each of these federal rates.[9] This percentage reflects the weighted average of the different states' rates, and the deductibility of state taxes at the federal level for those who itemize.

The personal rate on interest is then adjusted to account for the taxation of banks, as described in King and Fullerton (1984, pages 223-226). The resulting rate for households must then be averaged with a zero rate for the interest income of nonprofit institutions, and another rate for the interest income of life insurance companies.[10] The final estimate for $\tau_d$, as shown in Table 6.1, is 21.9 percent for prior law and 19.4 percent for tax reform.

Table 6.1 **Tax Rate Parameters**

| Type of Income | Prior Law | Tax Reform Act of 1986 |
|---|---|---|
| Interest Received | .219 | .194 |
| Dividends Received | .285 | .232 |
| Capital Gains | .074 | .125 |
| Noncorporate Income | .300 | .260 |
| Housing Deductions | .259 | .225 |

The household rate on dividends is similarly raised to account for state taxes and reduced to account for the dividends received by tax-exempt institutions and insurance companies.[11] The resulting value for $\tau_{ns}$ is .285 under current law and .232 under tax reform. The noncorporate rate is raised by state taxes, but not reduced by any holdings of institutions. It is .300 and .260 under prior law and tax reform, respectively.

Under prior law, only 40 percent of realized long term capital gains were subject to federal income taxation. Adding 5 percent to account for state taxes, and adjusting for exclusion brings the rate down to 18.4 percent. The advantage of deferral cuts the effective rate of tax approximately by half.[12] Taking into account insurance companies (taxed at a 28 percent rate) and tax exempts yields an effective rate on accrued capital gains of 7.4 percent. Tax reform eliminates the 60 percent exclusion on long term capital gains. Thus, we do not reduce the 26.7 percent rate to account for special treatment of capital gains income. However, we do account for state taxes, tax exempts, insurance companies, and deferral. Under tax reform, our overall effective rate on accrued capital gains is 12.5 percent.

The prior law weighted-average rate for mortgage interest deductions ($\tau_h$) is raised to .259 to account for state taxes. Tax reform lowers this rate to .225. In measuring incentives to invest in owner-occupied housing, we recognize that only a fraction of homeowners take advantage of the deductibility of property taxes by itemizing their deductions. The Treasury Individual Tax model indicates that only 48 percent of household real property taxes were deducted by itemizers ($\lambda = .48$). Tax reform would reduce this fraction to 41 percent.

2. Capital cost recovery

Potential for nonneutralities arises because different assets depreciate at many different rates, while tax codes tend to simplify by grouping assets into a few categories for depreciation allowances. In order to capture these nonneutralities, it is important to include many diverse assets in the model. Table 6.2 lists the 35 depreciable assets used in this study, including 20 kinds of equipment and 15 types of structures. The economic depreciation rates $\delta$ are estimated by Hulten and Wykoff (1981) and shown in the first column of Table 6.2. These range from a high of .333 for autos to a low of .015 for residential buildings. We also include inventories and land in our study. These are assumed not to depreciate, and they do not receive any depreciation allowances.

The second column of Table 6.2 shows the recovery periods available under the Accelerated Cost Recovery System (ACRS) of prior law. Autos are depreciated over 3 years, other equipment over 5 years, public utility structures over 10 or 15 years, and other structures over 19 years. Allowances over these lifetimes can be read from tables in the law. In effect, equipment and public utilities receive allowances based on 150 percent of declining balance

**Table 6.2 Tax Parameters for Each Asset**

| | Economic Depreciation Rate[a] | Recovery Period Prior Law (ACRS) | Recovery Period Tax Reform Act of 1986 | Prior Law Investment Tax Credit |
|---|---|---|---|---|
| 1 Furniture and Fixtures | .110 | 5 | 7 | .10 |
| 2 Fabricated Metal Products | .092 | 5 | 7 | .10 |
| 3 Engines and Turbines | .079 | 5 | 7 | .10 |
| 4 Tractors | .163 | 5 | 5 | .10 |
| 5 Agricultural Machinery | .097 | 5 | 7 | .10 |
| 6 Construction Machinery | .172 | 5 | 7 | .10 |
| 7 Mining and Oil Field Machinery | .165 | 5 | 5 | .10 |
| 8 Metalworking Machinery | .123 | 5 | 7 | .10 |
| 9 Special Industry Machinery | .103 | 5 | 7 | .10 |
| 10 General Industrial Equipment | .123 | 5 | 7 | .10 |
| 11 Office and Computing Machinery | .273 | 5 | 7 | .10 |
| 12 Service Industry Machinery | .165 | 5 | 7 | .10 |
| 13 Electrical Machinery | .118 | 5 | 7 | .10 |
| 14 Trucks, Buses, and Trailers | .254 | 5 | 5 | .10 |
| 15 Autos | .333 | 3 | 5 | .06 |
| 16 Aircraft | .183 | 5 | 5 | .10 |
| 17 Ships and Boats | .075 | 5 | 10 | .10 |
| 18 Railroad Equipment | .066 | 5 | 7 | .10 |
| 19 Instruments | .150 | 5 | 7 | .10 |
| 20 Other Equipment | .150 | 5 | 7 | .10 |
| 21 Industrial Buildings | .036 | 19 | 31.5 | .00 |
| 22 Commercial Buildings | .025 | 19 | 31.5 | .00 |
| 23 Religious Buildings | .019 | 19 | 31.5 | .00 |
| 24 Educational Buildings | .019 | 19 | 31.5 | .00 |
| 25 Hospital Buildings | .023 | 19 | 31.5 | .00 |
| 26 Other Nonfarm Buildings | .045 | 19 | 31.5 | .00 |
| 27 Railroads | .018 | 15 | 20.0 | .10 |
| 28 Telephone and Telegraph | .033 | 15 | 20.0 | .10 |
| 29 Electrical Light and Power | .030 | 15 | 20.0 | .10 |
| 30 Gas Facilities | .030 | 10 | 15.0 | .10 |
| 31 Other Public Utilities | .045 | 10 | 15.0 | .10 |
| 32 Farm Structures | .024 | 19 | 20.0 | .00 |
| 33 Mining, Shafts and Wells | .056 | 5 | 5.0 | .00 |
| 34 Other Nonbuilding Facilities | .029 | 19 | 31.5 | .00 |
| 35 Residential Structures | .015 | 19 | 27.5 | .00 |

*Economic depreciation rates come from Hulten and Wykoff (1981) and Jorgenson and Sullivan (1981).

with a switch at the optimal time to straight line. The depreciation basis is reduced by half the investment tax credit. Other structures receive allowances based on 175 percent of declining balance with an optimal switch to straight line.

At zero inflation, these allowances are high relative to economic depreciation. They are fixed in nominal terms, however, so that at moderate inflation rates, their real present value may be less than that of economic depreciation. We use a nominal discount rate in calculating z to account for the fact that allowances are based on historical cost. The exact formula is shown in King and Fullerton (1984, page 211).

Tax reform modifies depreciation allowances in several important ways. It expands the number of recovery classes from 5 to 8, and it generally lengthens recovery periods. Personal property is now depreciated over periods ranging from 3 to 20 years. In the 3, 5, 7, or 10 year class, personal property receives allowances based on 200 percent declining balance with an optimal switch to straight line. Personal property in the 15 and 20 year class receives 150 percent declining balance. Real nonresidential property is depreciated over a 31.5 year period, and residential real property is depreciated over a 27.5 year period, both based on the straight line method. Tax reform recovery periods for each of our 35 types of depreciable property are shown in the third column of Table 6.2.

The other aspect of capital cost recovery is the investment tax credit. Current law provides a 6 percent credit for automobiles, a 10 percent credit for other equipment, a 10 percent credit for public utility structures, and no credit for buildings. These rates are shown in the fourth column of Table 6.2. The Tax Reform Act of 1986 repeals these credits.

### 3. Other parameters

For local property tax rates (w), we use the same parameters under both tax regimes. Assuming that new investments will pay the same property tax on average as existing investments, data in Fullerton and Henderson (1984) indicate rates of .00768 for equipment and inventories, .01126 for business land and structures, .01550 for public utilities, and .01837 for residential land and structures.

We assume that marginal investments in all three sectors are financed using one-third debt and two-thirds equity (Fullerton and Henderson, 1984). However, we consider two alternative assumptions for the division of corporate equity between retained earnings and new share issues.

One scenario is based on the financing of existing corporate capital. Under this first scenario, we follow King and Fullerton (1984) in assuming that our marginal corporate investment is financed 61 percent through retentions, 34 percent through debt, and 5 percent through new share issues. This assumption is important because equation (6.3) indicates that the dividend tax (reduced by tax reform) affects investment financed through new share issues, while the capital gains tax (increased by tax reform) is relevant for investment financed by retained earnings.[13] The small 5 percent weight on new share issues in this scenario is thus consistent with the "new view" of dividend taxation (Auerbach, 1979, Bradford, 1981, and King, 1977) which holds that the taxation of dividends does not provide a serious disincentive to marginal investment in the corporate sector.

A competing tradition, however, is the "old view" which holds that dividend payout rates affect the cost of capital, and that there is significant double taxation of corporations because profits are taxed once at the firm level and again when distributed as dividends (McLure, 1979). Under this alternative theory, the reduction in the taxation of dividends would tend significantly to lower the effective tax rate for corporate investments, because firms are observed to distribute a sizable fraction of their earnings to shareholders.[14]

Thus for our second financing assumption, we construct a scenario that is consistent with the findings under the old view, for a payout rate of 50 percent. Although existing investments are financed 61 percent by retained earnings, it may not be possible as easily to finance additional new investments from that same source. If corporations have a limited supply of retained earnings and must increase their reliance on new shares to finance marginal investments, then equation (6.3) may be modified such that equity finance is divided evenly between retained earnings and new shares ($c_{re}$ =.3315 and $c_{ns}$ =.3315, with $c_d$ still equal to .337). Under this alternative, the dividend tax reduction has a more substantial impact, and the capital gains tax increase has a less substantial impact.

Finally, we set both the inflation rate, $\pi$, and the baseline net-of-all-tax rate of return, s, to 4 percent. Solving equation (6.2) with these assumptions and $\tau_d$ =.219, we find that i for prior law equals 10.2 percent. If s did not change under the Tax Reform Act of 1986, i would be 9.9 percent. The general equilibrium model below allows endogenous determination of the net rate of return s, but the next subsection first looks at incentives with a fixed net rate of return.

## C. Effective Tax Rate Results

This section first concentrates on incentives to invest in different assets. These detailed results are reported only for the "new view" financing assumptions because similar results are obtained for the old view. We next aggregate assets to reflect investment incentives at the sector and industry levels. These aggregate incentives are reported for both the new and old views of dividend taxation.

Table 6.3 shows the present value of depreciation allowances and marginal effective total tax rates for 36 assets in the corporate sector based on new view financing assumptions.[15] Under prior law, the first 20 types of equipment have very low tax rates or could even be subsidized. These effective tax rates range from 0 percent to +6 percent, despite the fact that we are including taxation at both the personal and corporate levels.[16] Equipment has these low effective tax rates because of investment tax credits and because of depreciation allowances in excess of economic depreciation. Structures (assets 21-26, 32-34) face considerably higher tax rates, between 33 and 50 percent, because they are not eligible for the investment tax credit and because of their less generous depreciation allowances. Public utility

**Table 6.3 Investment Incentives for Each Asset in the Corporate Sector***

| | Present Value of Allowances (z) | | Marginal Effective Total Tax Rate | |
|---|---|---|---|---|
| | Prior Law | Tax Reform Act of 1986 | Prior Law | Tax Reform Act of 1986 |
| 1 Furniture and Fixtures | .810 | .816 | .045 | .402 |
| 2 Fabricated Metal Products | | .816 | .050 | .383 |
| 3 Engines and Turbines | | .816 | .054 | .368 |
| 4 Tractors | | .866 | .031 | .400 |
| 5 Agricultural Machinery | | .816 | .049 | .389 |
| 6 Construction Machinery | | .816 | .028 | .460 |
| 7 Mining and Oil Field Machinery | | .866 | .030 | .401 |
| 8 Metalworking Machinery | | .816 | .042 | .415 |
| 9 Special Industry Machinery | | .816 | .047 | .395 |
| 10 General Industrial Equipment | | .816 | .042 | .415 |
| 11 Office and Computing Machinery | | .816 | -.001 | .532 |
| 12 Service Industry Machinery | | .816 | .030 | .454 |
| 13 Electrical Machinery | | .816 | .043 | .410 |
| 14 Trucks, Buses, and Trailers | ↓ | .866 | .004 | .460 |
| 15 Autos | .888 | .866 | .010 | .505 |
| 16 Aircraft | .810 | .866 | .025 | .414 |
| 17 Ships and Boats | | .749 | .055 | .410 |
| 18 Railroad Equipment | | .816 | .057 | .354 |
| 19 Instruments | | .816 | .034 | .441 |
| 20 Other Equipment | ↓ | .816 | .034 | .441 |
| 21 Industrial Buildings | .589 | .369 | .476 | .523 |
| 22 Commercial Buildings | | | .442 | .496 |
| 23 Religious Buildings | | | .423 | .481 |
| 24 Educational Buildings | | | .423 | .481 |
| 25 Hospital Buildings | | | .438 | .492 |
| 26 Other Nonfarm Buildings | ↓ | ↓ | .500 | .543 |
| 27 Railroads | .602 | .529 | .353 | .465 |
| 28 Telephone and Telegraph | | .529 | .383 | .496 |
| 29 Electric Light and Power | ↓ | .529 | .377 | .490 |
| 30 Gas Facilities | .696 | .609 | .311 | .465 |
| 31 Other Public Utilities | ↓ | .609 | .328 | .490 |
| 32 Farm Structures | .589 | .529 | .439 | .447 |
| 33 Mining, Shafts and Wells | .863 | .840 | .329 | .364 |
| 34 Other Nonbuilding Facilities | .589 | .366 | .455 | .506 |
| 35 Inventories | — | — | .493 | .471 |
| 36 Land | — | — | .515 | .495 |

*Calculations use "new-view" financing assumptions (with 4 percent inflation and a 4 percent net rate of return).

structures (assets 27-31) have tax rates that are not quite as high as those for most other structures, since they receive a 10 percent investment tax credit. Land and inventories receive neither credits nor accelerated depreciation allowances. Consequently, they face relatively high effective tax rates of 52 and 49 percent, respectively.

Tax reform reduces disparities in tax rates among assets, mostly as a result of rescinding the investment tax credit for equipment and public utility property. Effective tax rates for assets used in the corporate sector lie between 35 and 54 percent. The generally higher level of these rates is due in part to the changes in capital cost recovery provisions, but also to changes in the treatment of interest and capital gains. Currently, investments financed by debt are subsidized in that interest payments are deducted by corporations at a 49.5 percent rate, but included in taxable income of debtholders at an average marginal rate of only 21.9 percent. The difference between 49.5 percent and 21.9 percent is a 27.6 percentage-point subsidy. This subsidy is lowered by the Tax Reform Act to 18.9 percentage points, since interest deductions are made at a 38.3 percent rate while interest income is taxed at a 19.4 percent rate. Effective tax rates in the corporate sector also rise because capital gains on corporate retentions are taxed as ordinary income, thus raising the effective rate on accrued gains from 7.4 percent to 12.5 percent.

Table 6.4 presents user costs and effective tax rates under the new view for the corporate, noncorporate, and owner-occupied housing sectors. Summary measures of investment incentives also are presented for several aggregated assets: equipment, residential and nonresidential structures, public utility structures, inventories, and residential and nonresidential land. Investment incentives for each asset were aggregated using estimates of the 1984 stock of each asset in each sector.[17]

Under prior law, accelerated cost recovery provisions combine with nominal interest deductions to generate a total tax rate in the corporate sector that is below the statutory corporate rate. The overall effective tax rate in the corporate sector is 38.8 percent, only 3.6 percentage points higher than the 35.2 percent effective rate in the noncorporate sector, but 12 points higher than the 26.9 percent rate on owner-occupied housing (attributable to local property taxes). Tax reform actually increases the spread between the overall tax rate in the corporate sector and the overall rates in the other sectors. Less generous capital cost recovery and capital gains provisions overcome the effect of rate reduction to raise the rate in the corporate sector by 7.6 percentage points. The effect of less generous cost recovery provisions is offset to a large degree in the noncorporate sector by the 4 percentage point reduction in the tax rate of proprietors and partners. For housing, the effective tax rate rises slightly, reflecting reduced numbers of itemizers as well as reduced personal rates for interest deductions. Table 6.4 also indicates that tax reform would cut the capital-weighted standard deviation of all of these costs of capital, from .012 to .009.

**Table 6.4 Investment Incentives With New View of Dividend Taxes**

| | Prior Law | | Tax Reform Act of 1986 | |
|---|---|---|---|---|
| | ρ | t | ρ | t |
| Corporate Sector | | | | |
| Equipment | .042 | .038 | .069 | .422 |
| Nonresidential Structures | .072 | .441 | .078 | .489 |
| Public Utility Structures | .063 | .361 | .078 | .484 |
| Inventories | .079 | .493 | .076 | .471 |
| Land | .083 | .515 | .079 | .495 |
| Total | .065 | .388 | .075 | .464 |
| Noncorporate Business Sector | | | | |
| Equipment | .033 | -.201 | .056 | .289 |
| Nonresidential Structures | .059 | .323 | .061 | .348 |
| Public Utility Structures | .054 | .260 | .064 | .373 |
| Residential Structures | .065 | .383 | .067 | .401 |
| Inventories | .061 | .343 | .059 | .319 |
| Nonresidential Land | .064 | .379 | .062 | .358 |
| Residential Land | .072 | .441 | .069 | .424 |
| Total | .062 | .352 | .063 | .360 |
| Owner-Occupied Housing | .055 | .269 | .056 | .281 |
| Average Overall Cost of Capital | | .061 | | .065 |
| Standard Deviation | | .012 | | .009 |
| Average Overall Tax Rate | | .347 | | .387 |
| Interest Rate | | .102 | | .099 |

**Table 6.5 Investment Incentives With Old View of Dividend Taxes**

| | Prior Law | | Tax Reform Act of 1986 | |
|---|---|---|---|---|
| | ρ | t | ρ | t |
| Corporate Sector | | | | |
| Equipment | .051 | .212 | .074 | .459 |
| Nonresidential Structures | .083 | .518 | .084 | .522 |
| Public Utility Structures | .073 | .449 | .083 | .516 |
| Inventories | .093 | .571 | .081 | .509 |
| Land | .097 | .587 | .085 | .529 |
| Total | .077 | .482 | .080 | .500 |
| Noncorporate Business Sector* | .062 | .352 | .063 | .360 |
| Owner-Occupied Housing | .055 | .269 | .056 | .281 |
| Average Overall Cost of Capital | | .066 | | .067 |
| Standard Deviation | | .015 | | .011 |
| Average Overall Tax Rate | | .391 | | .405 |
| Interest Rate | | .102 | | .099 |

*The choice between the old and new view of dividend taxes does not affect the noncorporate sector, owner-occupied housing, or the overall interest rates.

Table 6.5 shows summary measures of investment incentives under the old view. Tax reform in this case has only a small effect on corporate and overall investment incentives. The lower tax on dividends helps offset both the higher tax on retentions and the less generous depreciation allowances. Thus, the effective tax rate in the corporate sector rises only slightly (by 1.8 percentage points) as a result of tax reform. The modest rise in the corporate sector cost of capital and effective tax rate, combined with a nearly constant cost of capital in the noncorporate sector means that, under the old view, tax reform does not markedly worsen distortions at the corporate/noncorporate margin. In addition, since the cost of capital for owner-occupied housing still rises slightly as a result of tax reform, distortions between noncorporate investment and owner-occupied housing are reduced. For these reasons, tax reform reduces the standard deviation of the cost of capital under the old view more than it does under the new view.

Next, Table 6.6 shows marginal effective tax rates by industry for both of our financing assumptions. Under prior law, and using new view financing assumptions, these industry effective rates range from 25.4 percent in the services industry to 44.3 percent in the transportation equipment industry. The services industry has a low effective tax rate because it is more than one-half noncorporate. Generally, manufacturing industries, including transportation equipment, face above average effective tax rates because they are largely corporate. Utilities face a relatively low effective tax rate,

Table 6.6 **Marginal Effective Total Tax Rates for Each Industry**

| | | New View | | Old View | |
|---|---|---|---|---|---|
| | Industry | Prior Law | Tax Reform Act of 1986 | Prior Law | Tax Reform Act of 1986 |
| 1 | Agriculture, Forestry and Fisheries | .361 | .354 | .366 | .356 |
| 2 | Mining | .310 | .442 | .392 | .469 |
| 3 | Crude Petroleum and Gas | .358 | .399 | .424 | .427 |
| 4 | Construction | .378 | .427 | .448 | .455 |
| 5 | Food and Tobacco | .469 | .469 | .500 | .504 |
| 6 | Textiles, Apparel and Leather | .400 | .457 | .488 | .492 |
| 7 | Paper and Printing | .355 | .454 | .450 | .489 |
| 8 | Petroleum Refining | .429 | .484 | .514 | .518 |
| | Chemicals and Rubber | .346 | .453 | .447 | .489 |
| 10 | Lumber, Furniture, Stone, Clay & Glass | .379 | .458 | .468 | .492 |
| 11 | Metals and Machinery | .409 | .467 | .499 | .502 |
| 12 | Transportation Equipment | .443 | .473 | .527 | .509 |
| 13 | Motor Vehicles | .365 | .466 | .466 | .502 |
| 14 | Transportation, Communication & Utilities | .270 | .443 | .370 | .475 |
| 15 | Trade | .422 | .433 | .487 | .462 |
| 16 | Finance and Insurance | .364 | .386 | .384 | .394 |
| 17 | Real Estate | .303 | .314 | .303 | .314 |
| 18 | Services | .254 | .403 | .313 | .422 |
| | Total | .347 | .387 | .391 | .405 |

even though they are mostly corporate, because they could make extensive use of the investment tax credit.

Tax reform changes the relative treatment of industries, and generally raises effective tax rates under these assumptions. Agriculture and real estate are now the low-tax industries, reflecting the benefit of rate reduction for nondepreciable land.[18] Transportation equipment remains the high-tax industry, due largely to repeal of the investment tax credit. Services face an above-average effective tax rate because of repeal of the investment tax credit and the longer recovery period for real property. Utilities also face an above-average effective tax rate, again due largely to repeal of the investment tax credit.

Industry effective tax rates for both prior law and tax reform are generally higher under the old view than under the new view. The ranking of industries by effective tax rate is also changed, reflecting the higher effective tax rates in the corporate sector under the old view. However, low tax industries are still largely noncorporate industries such as real estate and services. Tax reform has a smaller effect on industry investment incentives under the old view because effective tax rates in the corporate sector are not much changed from prior law.

## III. The General Equilibrium Model

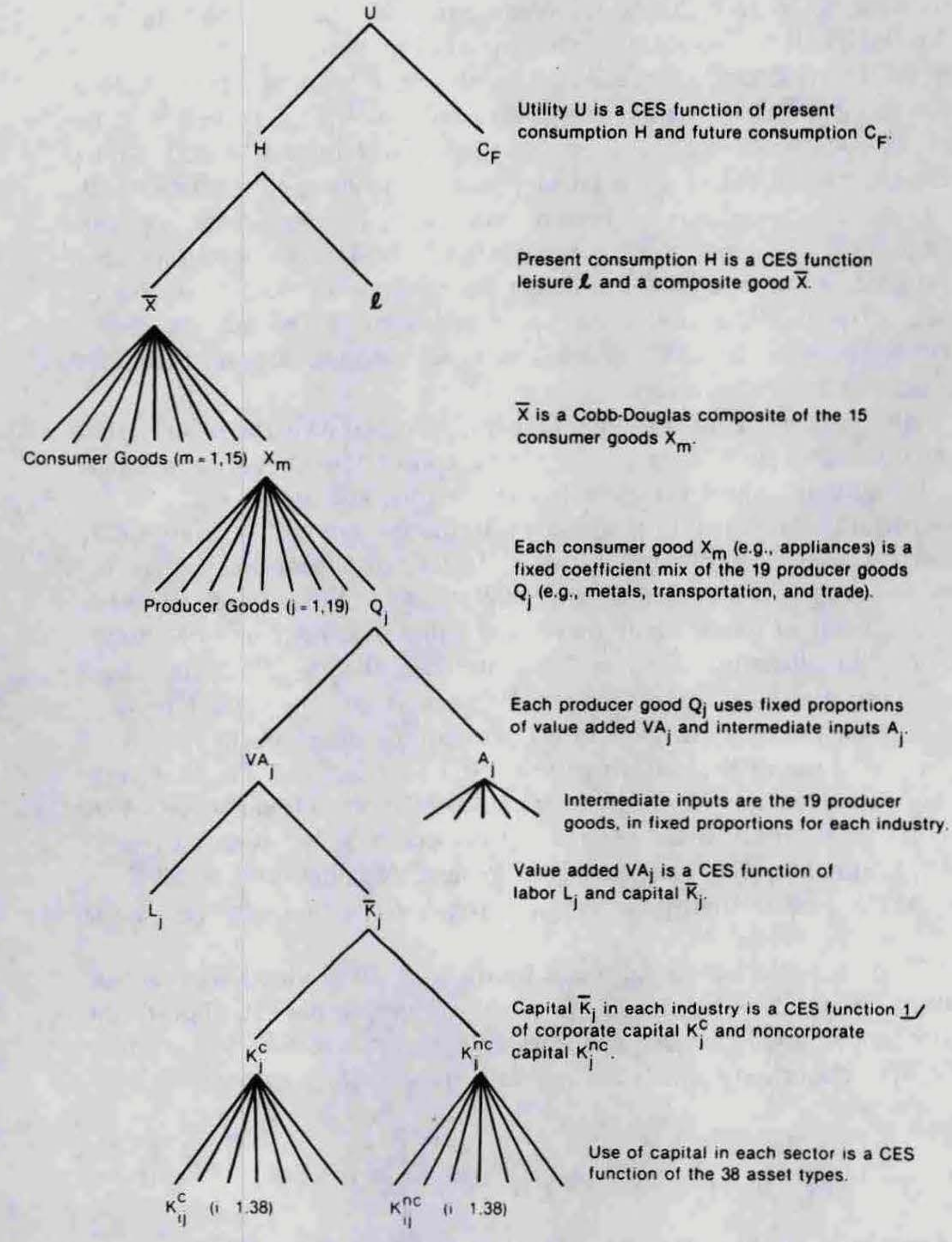
The investment incentives measured in the previous section are used as inputs into the general equilibrium model developed in Fullerton and Henderson (1986a). This model is capable of simulating the effects of tax reform on production by different industries, as well as on aggregate output. Furthermore, because of the detail on capital formation, it can trace the flow of capital simultaneously among different assets and sectors.

### A. A Description of the Model

The consumption side of the model is taken directly from the general equilibrium model of Fullerton, Shoven, and Whalley (FSW, 1978, 1983), as fully described in Ballard, Fullerton, Shoven, and Whalley (1985). Twelve income-differentiated households have initial endowments of labor and capital that can be sold for use in production. As indicated in the top part of Figure 6.1, these households each maximize a nested constant elasticity of substitution (CES) utility function by making an initial allocation of resources between present consumption and saving. The elasticity of substitution between present and future consumption is based on an exogenously specified aggregate estimate for $\eta$, the uncompensated savings elasticity with respect to the net rate of return. We examine alternative savings elasticities.[19]

In evaluating any tax reform the model simulates a sequence of equilibria in which the capital stock increases as a result of saving in the previous

**Figure 6.1 A Diagrammatic Summary of the Model**




1/ In the housing industry, capital is a CES function of owner-occupied housing and noncorporate rental housing.

period. Domestic saving is the only vehicle by which investment can be affected, since the model is not open to international capital flows. The model is open to balanced trade in commodities, but there is no scope for saving by foreigners to finance domestic capital formation.

With present resources, as indicated in the next level of Figure 6.1, a household can choose to buy some of its own labor endowment for leisure. The elasticity of substitution between consumption and leisure is based on an aggregate estimate of 0.15 for the uncompensated labor supply elasticity with respect to the net-of-tax wage. Present consumption expenditures are then divided among 15 consumer goods according to a Cobb-Douglas subutility nest. Each consumer good is a fixed-coefficient combination of outputs of the 18 industries. The model includes the entire spectrum of federal, state, and local taxes. These are typically modeled as ad valorem tax rates on purchases of appropriate products or factors.[20]

The Fullerton-Henderson amendments to this model come in the specification of production decisions. It is a generalized equilibrium model with endogenous allocation of capital across industries, sectors, and assets.

The structure of production is displayed in the bottom half of Figure 6.1, where each industry determines its use of factors in a sequence of stages. The first two stages are similar to the FSW model. First, producers have fixed requirements of intermediate inputs and value-added per unit of output. Second, they can substitute between labor and capital in a CES value-added function. The elasticity of substitution between labor and capital in each industry is chosen from an average of econometric estimates in the literature. These average elasticity estimates vary from 0.7 to 1.0 across the 18 private industries. However, this stage differs from the FSW model which constructs capital costs from observed tax payments. Instead, a Hall-Jorgenson (1967) type cost-of-capital formula determines the demand for composite capital $\bar{K}_j$ in each of the 18 private industries, emphasizing investment incentives at the margin.

The new model also adds a third and fourth stage to production decisions. In the third stage, for each industry j, producers decide how to allocate the composite capital good between the corporate sector and the noncorporate sector.[21] This allocation is made on the basis of the CES function:

$$K_j = \left[ (\beta_j)^{\frac{1}{\sigma}} (K_j^{nc})^{\frac{\sigma-1}{\sigma}} + (1-\beta_j)^{\frac{1}{\sigma}} (K_j^{c})^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \tag{6.4}$$

The parameter $\sigma$ is the elasticity of substitution between corporate and noncorporate capital. It measures the ease with which capital may be switched from one sector to the other. The parameter $\beta_j$ measures the relative importance of the noncorporate sector in industry j, while $K_j^c$ and $K_j^{nc}$ are the corporate and noncorporate capital stocks in the jth industry, respectively. The industry's demands for capital of each type are determined by cost minimizing behavior using $\rho_j^c$ and $\rho_j^{nc}$, composite corporate and noncorporate costs of capital within each industry. The Lagrangian multiplier from this minimization provides the composite cost of capital for the industry, mentioned above.

In the fourth stage of production decisions, firms in each sector of each industry allocate their composite capital among depreciable assets, land, and inventories, according to a CES function. For corporate firms, the function is written as:

$$K_j = \left[ \Sigma_{i=1}^{38} (\alpha_{ij}^c)^{\frac{1}{\varepsilon}} (K_{ij}^c)^{\frac{\varepsilon-1}{\varepsilon}} \right]^{\frac{\varepsilon}{\varepsilon-1}} \tag{6.5}$$

The parameter $\varepsilon$ is the elasticity of substitution among assets, assumed constant across assets, industries, and sectors. The parameter $\alpha_{ij}^c$ shows the importance of asset type i in the corporate sector of industry j. The stock $K_{ij}^c$ is the amount of capital of the ith asset type in corporate sector of the jth industry. The disaggregate capital demands $K_{ij}^c$ are obtained through cost minimizing behavior based on individual assets' costs of capital from equation (6.1). The Lagrangian multiplier from this minimization provides $\rho_j^c$, the composite corporate cost of capital for the jth industry. A similar equation is minimized to obtain demands for capital in the noncorporate sector of each industry, and to obtain $\rho_j^{nc}$, the composite noncorporate cost of capital.
Econometric estimates are not available for the key parameters $\sigma$, $\varepsilon$, $\alpha_{ij}$, and $\beta_{ij}$. As a consequence, the values of $\sigma$ and $\varepsilon$ are specified exogenously (but results for alternative specifications are reported below). The other key capital allocation parameters, $\alpha_{ij}$ and $\beta_{ij}$, are determined from the initial set of capital costs and the observed allocation of capital in the baseline case (prior law). Once $\sigma$ and $\varepsilon$ are specified, we solve backwards for the $\alpha_{ij}$ and $\beta_{ij}$ that must have pertained if producers actually had the observed demands while facing the initial costs of capital. This calibration allows the model to find the observed or "benchmark" equilibrium as a solution for the model when producers face initial capital costs. Once calibrated in this manner, $\alpha_{ij}$ and $\beta_{ij}$ remain constant across tax policy changes.

For a given set of technological parameters, the allocation of capital depends ultimately on user costs for individual asset types. As described above, these are built up from information on statutory tax rates, credit rates, tax lifetimes, and other statutory specifications. These costs also depend endogenously on the real after-tax rate of return, s, determined in equilibrium. These disaggregate asset costs are used directly for each sector to determine allocations among assets in the last stage of Figure 6.1. A composite of those capital costs is calculated for the corporate sector and for the noncorporate sector of each industry, in order to determine the allocation between sectors in the next-to-last stage of Figure 6.1. Finally, an additional composite of the two sectors is calculated for each industry, in order to determine the allocation of capital among industries. Thus, each industry has a different mix of assets in each sector, as well as a different mix of sectors, all determined endogenously. When the total use of capital equals the total available supply, we have equilibrium in the capital market; when other markets clear as well, we have a general equilibrium.

An important advantage of this model is that it is not limited to a unitary elasticity of substitution among assets, as implied by the Cobb-Douglas functional form common in previous studies. Instead, the elasticity of substitution among assets ($\varepsilon$) and among sectors ($\sigma$) may be specified exogenously. These generalizations are important because the choices of $\varepsilon$ and $\sigma$, as well as of $\eta$, have much bearing on the relative size of different distortions and therefore on the net effect of tax reform. If $\varepsilon$ is high, for example, then the change in the relative tax treatment of different assets will result in a more significant change in the firm's production technology. A high value for $\varepsilon$ will therefore imply relatively high welfare gains from the more uniform tax treatment of different assets. If $\sigma$ is high, then the sectoral allocation of capital is more sensitive to changes in the relative tax treatment of corporations, noncorporate business, and owner-occupied housing. High values of $\sigma$ would be associated with high welfare gains from more uniform tax treatment of sectors. Finally, the choice of $\eta$, the savings elasticity, matters for aggregate capital accumulation. If $\eta$ is high, then any change in the overall taxation of the return to income from capital would result in a higher saving response. As this assumed elasticity rises, any tax wedge between the gross and net return to saving results in a greater measured efficiency loss.

## B. Simulation and Sensitivity

Before presenting the results themselves, it is necessary to describe our simulations. We simulate a sequence of 6 equilibria that are 10 years apart, so our total simulation interval is 50 years. All our simulations assume an adjustment in lump-sum taxes (positive or negative as appropriate) in order to restore the revenue yield of the baseline. We perform the simulations for each view of dividend taxes under several alternative sets of parameters.

We consider values of $\varepsilon$ and $\sigma$ between 0.15 and 2.5, and values of $\eta$ between 0 and 0.6. As stressed in Fullerton and Henderson, (1986a) existing econometric work on substitution elasticities does not consider the number of assets included in this model. Neither does it attempt specifically to measure a sectoral substitution elasticity. There remains considerable uncertainty about these parameter values. For the savings elasticity, our lower bound of zero is consistent with the estimate of Howrey and Hymans (1978), and our upper bound of .6 is in the upper range of estimates in Boskin (1978).

Under the new view of dividend taxation, tax reform increases distortions between present and future consumption, for which $\eta$ is important. Under the old view, this effect is similar but smaller. Under both views, tax reform reduces distortions in the choice among assets, for which $\varepsilon$ is important.

Thus, assessment of the overall efficiency effects of tax reform depends on the relative sizes of $\varepsilon$ and $\eta$. The effect of tax reform on intersectoral distortions is slightly more complicated. Under both the new and old views, corporate/noncorporate distortions are magnified while noncorporate/owner-occupied housing distortions are reduced. If we adopt the new view so that the corporate/noncorporate distortion is more greatly affected by tax reform, then it seems likely that increases in $\sigma$ will reduce any efficiency gains bought on by reduction in interasset distortions. In contrast, if we adopt the old view, the corporate/noncorporate distortion is only slightly increased by tax reform. Thus, increases in $\sigma$ might increase or decrease efficiency gains, depending on whether the improvement in the margin between noncorporate rental housing and owner-occupied housing more than offsets the effect of the margin in other industries between the corporate sector and the noncorporate sector.

## C. Interpretation of Simulations

Simulation analysis such as we perform here can provide highly detailed results. It is always necessary to bear in mind, however, the limitations of such studies. We would like to mention three types of issues: the quantification of tax reform measures; the specification of economic behavior; and the usefulness of our results for policy decisions.

First, although our simulations take into account major elements of the tax reform proposals as they pertain to capital formation, they do not take into account all aspects of fundamental tax reform. For example, while we capture the effect of capital gains changes on the overall incentive to invest, we do not capture their effect on holding periods or realizations. We do not capture the effect of tax reform on incentives to churn assets, to merge with other firms, to increase compliance, or to join the labor force. We omit the alternative minimum tax and the passive loss rules. In addition, we do not capture new features that could have sizable influences on particular industries. Examples include special features that relate to energy and to accounting for multiperiod production.[22]

Second, any simulation model necessarily simplifies some aspects of economic decisionmaking. One example relevant to our model is the specification of financial choices. Tax reform raises the cost of debt finance for corporations, yet we do not alter firms' debt-equity ratios to reflect this change. Also, we have made specific choices with respect to capital allocation decisions. Our use of the $\varepsilon$ parameter implies that firms view all assets as substitutes for one another in production; we omit the possibility that some assets are complements. Our use of the $\sigma$ parameter attempts to capture the impact of capital costs on incorporation decisions, but we do not explicitly model the effect on these decisions of providing limited liability or access to national financial markets.

Finally, it should be emphasized that we do not consider the effects of tax reform on "fairness" or "simplicity," concepts that were important throughout the development of the tax reform process. Any changes in the achievement of these other goals would be additional criteria by which to assess tax reform. In summary, the various results found in the next section must necessarily be interpreted with caution. Any overall evaluation of tax reform should use appropriate additional information and judgment.

## IV. General Equilibrium Results

### A. The Net Effect on Economic Well-being

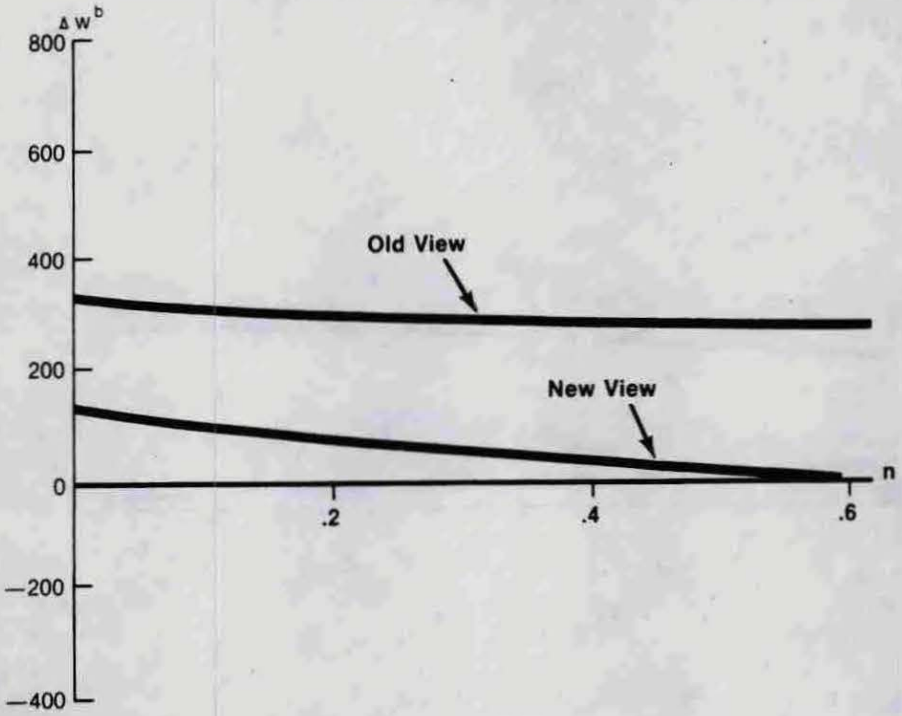
Previous literature provides very little guidance in the selection of values for our three key elasticity parameters. Therefore our strategy here is to select one set of parameters for a starting point and then to vary each parameter systematically. The starting point is taken to be the case where $\varepsilon = 1$, $\sigma = 1$, and $\eta = .4$, so that asset and sectoral combinations are Cobb-Douglas and savings are moderately responsive to net returns.

Under the "new view," with these parameters, the net effect of tax reform is a \$54 billion present value welfare gain, measured by the sum of equivalent variations over the twelve consumers, in 1984 dollars. This gain is 0.04 percent of the present value of real income in the baseline. The increase in economic well-being is achieved despite the reduction of investment incentives. That is, the greater efficiency of investment more than compensates for a lower total. The capital stock is still growing, of course, but after 50 years it is 1.9 percent lower than it would have been under prior law. Under the "old view," with the same elasticity parameters, the net effect of tax reform is a \$302 billion present value welfare gain (0.2 percent of baseline income). The overall cost of capital does not rise as much in this case, so increases in allocation efficiency are offset to a lesser degree. This more-efficient capital stock is only 0.6 percent lower than in the baseline after 50 years.

The next three figures display the net effects of varying the three elasticity parameters one at a time.

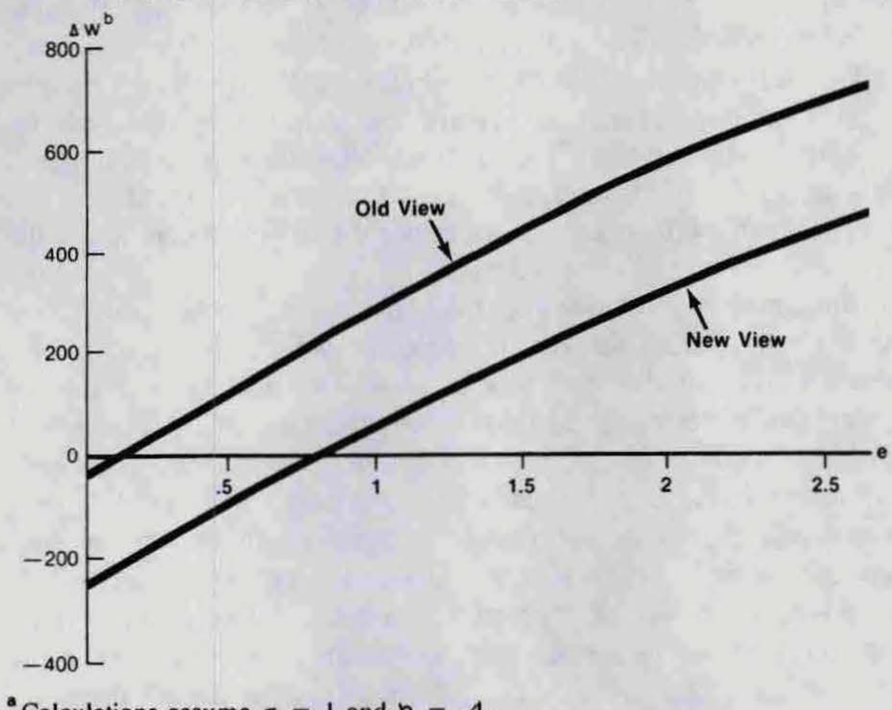
Figure 6.2 shows the effect of alternative savings elasticities. The vertical axis measures the present value change in welfare, and the horizontal axis shows values of $\eta$ ranging from 0 to .6 (while $\varepsilon = \sigma = 1$). As expected, welfare gains fall as $\eta$ increases. However, for both views of dividend taxation, welfare gains are positive for all values of $\eta$ that we consider. Under the old view welfare gains range from \$337 billion to \$286 billion. Under the new view, welfare gains are smaller, ranging from \$141 billion to \$13 billion. Welfare gains are larger for the old view because dividend tax reductions are more important. As indicated in Tables 6.5 and 6.6, tax reform in this case causes a smaller increase in overall effective tax rates, a larger improvement in interasset neutrality, and a smaller increase in the intersectoral distortions. Because tax reform raises effective tax rates more sharply under the new view, the slope of the curve for the new view is steeper.

Figure 6.2 **Savings Elasticity and the Welfare Gain from the Tax Reform Act of 1986**[a]



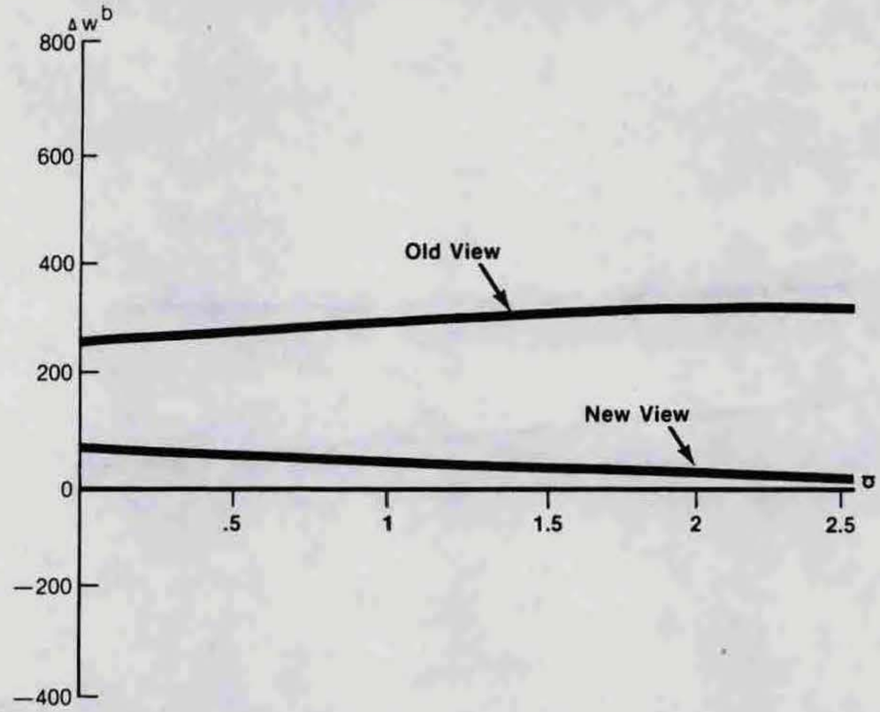

[a]Calculations assume $\sigma = \varepsilon = 1$.
[b]In billions of 1984 dollars.

Figure 6.3 **Asset Substitution and the Welfare Gain from the Tax Reform Act of 1986**[a]




[a]Calculations assume $\sigma = 1$ and $\eta = .4$.
[b]In billions of 1984 dollars.

Figure 6.4 **Sectoral Substitution and the Welfare Gain from the Tax Reform Act of 1986[a]**




[a]Calculations assume ε = 1 and η = .4.
[b]In billions of 1984 dollars.

Figure 6.3 plots the relationship between tax reform's welfare effects and ε, the elasticity of substitution across assets (while $\sigma = 1$ and $\eta = .4$). Because tax reform improves interasset neutrality, welfare gains rise with ε and reach a maximum of $733 billion under the old view when $\varepsilon = 2.5$. However, with very low substitutability among assets, tax reform can actually reduce welfare: adverse effects on savings and the intersectoral allocation of capital offset the smaller favorable effects on interasset neutrality. As in Figure 6.2, tax reform has more favorable effects on welfare under the old view than under the new view.

Figure 6.4 illustrates the relationship between the economic benefits of tax reform and σ, the parameter for intersectoral substitution possibilities (while $\varepsilon = 1$ and $\eta = .4$). For all values of σ between 0.15 and 2.5, our simulations indicate positive welfare effects under both the new and old views of dividend taxation. Because of the increase in all intersectoral distortions under the new view, welfare improvements fall as σ rises. The fact that they remain positive shows that asset substitution effects dominate sectoral substitution effects even when σ rises to 2.5. Under the old view, tax reform generates improvements in welfare that rise as σ rises. The positive slope reflects the smaller increase in corporate/noncorporate distortions under the old view. As in Figures 6.2 and 6.3, tax reform stimulates larger improvements in welfare when the reduction in dividend taxation has a larger effect and the increase in capital gains tax has a smaller effect.

## B. Allocation of Capital Among Assets and Sectors

Under prior law, investment in equipment is tax-favored as a result of the investment tax credit and very short lifetimes for depreciation. At the other extreme, returns to investments in inventories and land face statutory tax rates.

Tax reform narrows the differences in these tax treatments. As a result, firms alter their relative demands for these assets. Table 6.7 illustrates this reallocation for the corporate sector, for the case where $\sigma = 1$, $\varepsilon = 1$, and $\eta = .4$, with both the "new view" and the "old view." Similar reallocations take place in the noncorporate business sector. Under our 1984 baseline data, 29.5 percent of the corporate capital stock is in the form of equipment. Under the new view, with tax reform, this share would drop to 20.5 percent. The percentage for inventories would increase from 34.2 to 41.2 percent under tax reform. The use of land and structures in the corporate sector would also increase. The corporate sector would use a smaller share of public utility property. Results for the old view are similar. In the simulations with a higher value of $\varepsilon$ (not shown), these reallocations are in the same direction but larger in magnitude. As the asset elasticity parameter increases, corporations change their production processes more sharply in reaction to changes in relative user costs for different assets.

Because it changes relative investment incentives, tax reform redistributes capital across the three sectors of the economy. Table 6.8 shows the results of this redistribution. Under the new view of dividend taxation, the corporate sector cost of capital rises by 15 percent, from .065 to .075, while the costs of capital in the noncorporate and owner-occupied housing sectors are largely unchanged. After 50 years, this 15 percent increase in the cost of capital in the corporate sector leads to an 8 percent reduction in the fraction of capital employed in the corporate sector. The capital flowing out of the corporate sector goes largely into the noncorporate sector. Owner-occupied housing is only slightly increased as a percentage of the overall stock of capital. Table 6.8 also shows results for the old view of dividend taxation. Under this alternative assumption capital shares are less sensitive to tax reform. This reflects smaller effect of tax reform on intersectoral investment incentives when dividend taxation is more important and capital gains are less important. The changes in shares, however, follow the same pattern as under the new view.

## C. Results for Industries

As was indicated in Table 6.7, tax reform encourages the use of nondepreciable assets such as land and inventories. It also expands the noncorporate and owner-occupied housing sectors relative to the corporate sector, especially under the new view of dividend taxation. Thus, we would expect that noncorporate industries using relatively large amounts of land and inventories would expand relative to other industries as a result of tax reform.

Table 6.7 **Eventual Allocation of Corporate Capital Across Asset Types***

| | | Tax Reform Act of 1986 | |
|---|---|---|---|
| | Prior Law | New View | Old View |
| | (After fifty years. as proportion of total) | | |
| Equipment | .295 | .205 | .213 |
| Nonresidential Structures | .149 | .156 | .154 |
| Public Utility Structures | .112 | .105 | .104 |
| Inventories | .342 | .412 | .409 |
| Land | .101 | .122 | .120 |

*Calculations assume $\sigma = \varepsilon = 1$, and $\eta = .4$

Table 6.8 **Eventual Allocation of Capital Across Sectors***

| | | Tax Reform Act of 1986 | |
|---|---|---|---|
| | Prior Law | New View | Old View |
| | (After 50 years as a proportion of total) | | |
| Corporate | .373 | .343 | .364 |
| Noncorporate | .371 | .394 | .378 |
| Owner-occupied Housing | .257 | .263 | .258 |

*Calculations assume $\sigma = \varepsilon = 1$, and $\eta = .4$

Table 6.9 shows the induced changes in output and capital in each of 18 private industries. We start with the new view of dividend taxation. Agriculture, which is largely noncorporate and uses a large proportion of land, experiences the largest percentage increase in output and capital. No industry other than agriculture experiences increases in output or capital of larger than 3 percent. Utilities and mining experience the largest contraction of output and capital as a result of tax reform. Overall, under the new view, tax reform causes a .4 percent reduction in output and a 1.9 percent reduction in capital.

Under the old view, in general, induced changes in output and capital are proportionally smaller. Capital falls by .6 percent. Output, however, rises by .2 percent. Agriculture again experiences the largest percentage increase in output, and utilities still experience the largest percentage reduction in output. However, the transportation equipment industry now experiences the largest percentage increase in capital, followed by agriculture. Capital in the utility industry continues to contract the most under the old view.

The treatment of dividend taxation also can affect the sign of changes in output and capital for certain industries. The metal and machinery industry,

Table 6.9 **Eventual Output and Capital Stock by Industry**[a]

| | Industry | Baseline after fifty years (billions of 1984 dollars) Output | Capital | Tax Reform Act of 1986[b] New view Output | Capital | Old view Output | Capital |
|---|---|---|---|---|---|---|---|
| 1 | Agriculture, Forestry & Fisheries | 794 | 6,255 | 8.9% | 9.0% | 5.5% | 5.4% |
| 2 | Mining | 94 | 204 | -5.3% | -17.6% | -3.2% | -12.3% |
| 3 | Crude Petroleum and Gas | 106 | 917 | -3.8% | -4.3% | -.9% | -.8% |
| 4 | Construction | 659 | 708 | -1.5% | -5.9% | -.4% | -1.3% |
| 5 | Food and Tobacco | 960 | 454 | 2.2% | -2.9% | 2.1% | 1.1% |
| 6 | Textiles, Apparel & Leather | 472 | 179 | -.4% | -6.1% | .6% | .0% |
| 7 | Paper and Printing | 352 | 347 | -.9% | -12.1% | .0% | -5.8% |
| 8 | Petroleum Refining | 234 | 252 | -1.7% | -5.6% | .4% | -.8% |
| 9 | Chemicals and Rubber | 519 | 586 | -2.1% | -14.0% | -.8% | -7.2% |
| 10 | Lumber, Furniture, Stone, Clay & Glass | 357 | 296 | -.8% | -9.8% | -.0% | -3.4% |
| 11 | Metals and Machinery | 1,545 | 2,025 | -2.0% | -7.3% | .4% | -.5% |
| 12 | Transportation Equipment | 147 | 246 | .7% | -1.2% | 3.0% | 6.5% |
| 13 | Motor Vehicles | 430 | 280 | -2.1% | -13.2% | -.5% | -5.7% |
| 14 | Transportation, Communiction & Utilities | 1,085 | 3,308 | -5.0% | -20.2% | -3.8% | -14.7% |
| 15 | Trade | 1,641 | 4,438 | -.2% | .8% | .7% | 4.8% |
| 16 | Finance and Insurance | 594 | 572 | -.5% | -.5% | -.2% | .7% |
| 17 | Real Estate | 1,139 | 10,897 | .6% | .7% | .1% | .0% |
| 18 | Services | 1.707 | 887 | -.8% | -16.8% | -.4% | -14.3% |
| | Total[c] | 12,836 | 32,855 | -.4% | -1.9% | .2% | -.6% |

[a] Calculations assume $\sigma = \varepsilon = 1$ and $\eta = .4$.
[b] Percent change from the baseline.
[c] Detail may not add to total due to rounding.

for example, experiences a 2 percent reduction in output under the new view, but a .4 percent increase in output under the old view. The food and tobacco industry experiences almost a 3 percent reduction in capital under the new view, but over a 1 percent increase under the old view.

## V. Summary

We have used the disaggregate general equilibrium model developed in Fullerton and Henderson (1986a, b) to analyze the Tax Reform Act of 1986. This model focuses on measuring changes in the taxation of income from real capital assets. It is capable of measuring the net effects of changes in statutory rates, credits, and depreciation allowances on the allocation of capital among assets, sectors, and industries. It also captures the effect on total savings and investment of changes in overall incentives.

We find that under a wide variety of parameter values, reform of capital taxation results in net improvements in welfare. This result holds even though in many instances both output and capital formation fall slightly as a result of tax reform. The provisions of tax reform that affect capital tend to stimulate production in industries such as agriculture that employ large amounts of nondepreciable assets fully benefiting from statutory rate reduction. We also find that results are sensitive to the relative importance of dividend and capital gains taxation. If dividend taxes are a significant source of distortion in the allocation of capital, then tax reform compares more favorably with prior law than if dividend taxation is unimportant.

## FOOTNOTES

[1] This paper does not consider the effects of these rate cuts on labor income and labor supply. We concentrate exclusively on their effects on capital.

[2] The effects of uncertainty and imperfect loss offsets are investigated in Auerbach (1986) and Auerbach and Poterba (1987).

[3] For a variety of reasons not captured here, firms may not always minimize their taxes by taking the earliest possible deductions. In order to concentrate on the tax wedge and to insure comparability across tax regimes, however, calculations here assume tax minimizing behavior. Similarly, firms pay unnecessary taxes by using FIFO inventory accounting, so calculations here assume LIFO methods. The effect of FIFO inventory accounting is shown in Fullerton (1987).

[4] For the social rate of return in the noncorporate sector, $\rho^{nc}$, we use an expression analogous to 6.1 where u is replaced by $\tau_{nc}$, the marginal rate on noncorporate business income, and r is replaced by the corresponding noncorporate discount rate. Since owner-occupied housing receives no credit or depreciation allowances, the analogous expression in that sector is $\rho^h = r - \pi + (1-\lambda\tau_h)w$, where $\tau_h$ is the marginal rate at which interest and property taxes are deducted and $\lambda$ is the fraction of property taxes deducted by homeowners.

[5] If individuals earn the same rate of return net of all taxes from debt and equity, then the firm must earn a higher marginal product on a project financed by equity than on the same project financed by debt. In a context of perfect certainty, this can be justified only if for some reason firms must use a given mix of finance. Here, we do not model the role of uncertainty or institutional restrictions that influence observed financing choices. These choices are taken to be exogenous. An alternative assumption might be that firms, rather than individuals, arbitrage between debt and equity. The effects of firm arbitrage on measured tax rates are explored in Fullerton and Henderson (1984), and Fullerton (1987) as well as Fullerton, Gillette and Mackie (1987, this volume). This alternative view would be supported in the perfect certainty framework only if individuals in different income groups specialize in different assets, as in Miller (1977).

[6] In the noncorporate sector, the discount rate is $n_d i(1-\tau_{nc}) + n_e i(1-\tau_d)$, where $n_d$ and $n_e$ are the fractions of noncorporate investment financed by debt and equity, respectively. The rate $\tau_{nc}$ is the marginal rate on noncorporate business income, and $\tau_d$ is the marginal rate on interest income. In the owner-occupied housing sector, the discount rate is $h_d i(1-\tau_h) + h_e i(1-\tau_d)$, where $h_d$ and $h_e$ are the fractions of owner-occupied housing investment financed by debt and equity, respectively, and $\tau_h$ is the marginal rate at which homeowners deduct interest payments and property taxes.

[7] Total effective tax rates are meaningful in our model with no international capital flows, because all taxes on capital affect total savings and investment. They may not be as meaningful in a more open economy where corporate taxes affect primarily investment and personal taxes affect primarily savings.

[8] See Cilke and Wyscarver (1987, this volume) for further description of this model.

[9] See page 221 of King and Fullerton (1984).

[10] The adjusted rate for households is .267 under prior law and .232 under Tax Reform. The weights for households, tax-exempts, and insurance companies are .609, .153, and .238 respectively. Under prior law, a special 20 percent deduction reduced the rate on insurance companies from 46 to 36.8 percent. The Tax Reform Act repeals this special deduction and leaves them with the same 34 percent rate as other corporations.

[11] For dividends and capital gains, we use weights given by the holdings of corporate stock: .743 for households, .216 for tax-exempt institutions, and .041 for insurance companies. The dividend rate of insurance companies was .069 under prior law and .068 under tax reform, accounting for the intercorporate dividend deduction.

[12] See King and Fullerton (1984, pages 221-222).

[13] Consider first a firm that wishes to invest \$1 more by issuing \$1 of new shares. The asset earns a return r, net of corporate tax, which the firm pays out as a dividend. The ultimate return to the new shareholder is this $(1-\tau_{ns})r$. Alternatively, consider a firm that wishes to invest in \$1 more of capital by retaining an additional dollar of earnings. To retain an extra dollar, the firm must necessarily reduce dividend payments. The \$1 dividend foregone represents $\$(1-\tau_{ns})$ net of personal tax. In the following period the asset earns a return r net of corporate tax and $(1-\tau_{ns})r$ net of personal tax. The return to shareholders relative to dividends foregone in the first period is just r. This return is independent of the parameter $\tau_{ns}$ since it affects identically the numerator and denominator in the calculation of the rate of return.

[14] The new view receives empirical support in a study by Auerbach (1984), but the old view is found more compatible with historical evidence in Poterba and Summers (1983, 1985). Poterba and Summers (1985) also explain some conceptual problems associated with each theory.

[15] Starting from the 35 depreciable assets listed in Table 6.2, the corporate sector in this model excludes residential structures but includes land and inventories.

[16] A subsidy, or negative effective tax rate, means that tax credits and depreciation allowances are so generous that they outweigh the effects of taxes on net income and property values. Under a subsidy, to earn $s=.04$ after tax, the required value of $\rho$ is lower than 4 percent.

[17] From the July 1985 Survey of Current Business, we obtain 1981 data for corporate equipment, corporate structures, noncorporate equipment, and noncorporate structures. We also obtain data for total depreciable capital stocks by 18 industries. We project each of these 22 capital stock figures to 1984 by using an econometric estimate of the relationship between economic growth and capital formation. We then use an RAS procedure with these 1984 targets to adjust an unpublished 1977 matrix from Dale Jorgenson, showing each of these four types of asset used in each of the 18 industries. Finally, we obtain the finer capital allocations for all 20 types of equipment and 15 types of structures, by using disaggregate proportions in the Jorgenson data. These data also form the basis for our 1984 projections of the values of land and inventories in each of our industries.

[18] This model considers fully taxable firms and infinite holding periods. It thus omits changes in the alternative minimum tax, passive loss rules, and the churning of tax shelter assets such as those in real estate. Also, we assume the same financing shares for all assets in all industries.

[19] Our model assumes that households' expectations of the rate of return are myopic. Ballard and Goulder (1985) examine the effect of incorporating perfect foresight into the Fullerton-Shoven-Whalley model.

[20] The model also requires that government run a balanced budget. Therefore, when our simulations raise (lower) national output and income, we must offset the resulting revenue gains

(losses) by cutting (increasing) some other tax. We do this by changing income taxes in a lump-sum manner. We thus abstract from changes in personal taxation of labor income.

[21] In the housing industry, producers instead allocate the composite capital good between owner-occupied housing and noncorporate rental housing.

[22] See Fullerton, Gillette and Mackie (1987, this volume) for additional work in this area. They find that these cost of capital measures are relatively unaffected by accounting changes, cost capitalization, and other provisions that are not modelled here. These provisions affect the timing of revenue more than they affect the present value of tax on marginal investment. Indeed, it is because tax revenue is often a poor guide to investment incentives that we turn to the concept of the cost of capital. Still, because the cost of capital cannot account for every feature of the tax code, it may omit important effects on incentives.

## REFERENCES


Auerbach, Alan J. "Wealth Maximization and the Cost of Capital." *Quarterly Journal of Economics* 93 (1979), pp. 433-46.

Auerbach, Alan J. "Taxes, Firm Financial Policy, and the Cost of Capital: An Empirical Analysis. " *Journal of Public Economics* 23 (1984), pp. 27-57.

Auerbach, Alan J. "The Dynamic Effects of Tax Law Asymmetries." *Review of Economic Studies* 53 (1986), pp. 205-25.

Auerbach, Alan J. and James M. Poterba. "Tax Loss Carryforwards and Corporate Tax Incentives." In M. Feldstein (Ed.), *Taxation and Capital Formation*. Chicago: University of Chicago Press, 1987.

Ballard, Charles L. and Lawrence H. Goulder. "Consumption Taxes, Foresight, and Welfare: A Computable General Equilibrium Analysis." In John Piggott and John Whalley (Eds.), *New Developments in Applied General Equilbrium Analysis*. New York: Cambridge University Press, 1985.

Ballard, Charles L., Don Fullerton, John B. Shoven, and John Whalley. *A General Equilibrium Model for Tax Policy Evaluation*. Chicago: University of Chicago Press, 1985.

Boskin, Michael J. "Taxation, Saving, and the Rate of Interest." *Journal of Political Economy* 86 (1978), pp. S3-S27.

Bradford, David F. "The Incidence and Allocation Effects of a Tax on Corporate Distributions." *Journal of Public Economics* 15 (1981), pp. 1-23.

Bradford, David F. and Don Fullerton. "Pitfalls in the Construction and Use of Effective Tax Rates." In C.R. Hulten (Ed.), *Depreciation, Inflation, and the Taxation of Income from Capital*. Washington, D.C.: The Urban Institute Press, 1981.

Cilke, James and Roy Wyscarver. "The Individual Income Tax Simulation Model." Chapter 2 in this volume.

Feldstein, Martin, Louis Dicks-Mireaux and James Poterba. "The Effective Tax Rate and the Pretax Rate of Return." *Journal of Public Economics* 21 (1983), pp. 129-58.

Fullerton, Don. "The Indexation of Interest, Depreciation, and Capital Gains and Tax Reform in the United States." *Journal of Public Economics* 32 (1987), February, pp. 25-51.

Fullerton, Don, Robert Gillette and James Mackie. "Investment Incentives Under the Tax Reform Act of 1986." Chapter 5 in this volume.

Fullerton, Don and Yolanda Kodrzycki Henderson. "Incentive Effects of Taxes on Income from Capital: Alternative Policies in the 1980's." In C.R. Hulten and I.V. Sawhill (Eds.). *The Legacy of Reaganomics: Prospects for Long-Term Growth*. Washington, D.C.: The Urban Institute Press, 1984.

Fullerton, Don and Yolanda Kodrzycki Henderson. "Long-run Effects of the Accelerated Cost Recovery System." *The Review of Economics and Statistics* 67 (1985), pp. 363-72.

Fullerton, Don and Yolanda Kodrzycki Henderson. "A Disaggregate Equilibrium Model of the Tax Distortions Among Assets, Sectors, and Industries." Working Paper No. 1905 (1986a). Cambridge, MA: National Bureau of Economic Research.

Fullerton, Don and Yolanda Kodrzycki Henderson. "The Impact of Fundamental Tax Reform on the Allocation of Resources." Working Paper No. 1904 (1986b). Cambridge, MA: National Bureau of Economic Research.

Fullerton, Don, John B. Shoven, and John Whalley. "General Equilibrium Analysis of U.S. Taxation Policy." *In 1978 Compendium of Tax Research.* Washington, D.C.: Government Printing Office, 1978 .

Fullerton, Don, John B. Shoven, and John Whalley. "Replacing the U.S. Income Tax with a Progressive Consumption Tax." *Journal of Public Economics* 20 (1983), pp. 3-23.

Gravelle, Jane G. "Effects of the 1981 Depreciation Revisions on the Taxation of Income from Business Capital." *National Tax Journal* 35 (1982), pp. 1-20.

Hall, Robert and Dale W. Jorgenson. "Tax Policy and Investment Behavior." *American Economic Review* 57 (1967), pp. 391-414.

Harberger, Arnold C. "Efficiency Effects of Taxes On Income From Capital." In M. Krzyzaniak (Ed.), *Effects of Corporation Income Tax.* Detroit: Wayne State University Press, 1966.

Henderson, Yolanda, K. "Lessons from Federal Reform of Business Taxes." *New England Economic Review.* November/December 1986.

Howry, E. Philip and Saul H. Hymans. "The Measurement and Determination of Loanable Funds Saving." *Brookings Papers on Economic Activity* (1978), pp. 655-685.

Hulten, Charles R. and Frank C. Wykoff. "The Measurement of Economic Depreciation." In C.R. Hulten (Ed.), *Depreciation, Inflation, and the Taxation of Income from Capital,* Washington, D.C.: The Urban Institute Press, 1981.

Jorgenson, Dale W. and Martin A. Sullivan. "Inflation and Corporate Capital Recovery." In C.R. Hulten (Ed.), *Depreciation, Inflation, and the Taxation of Income from Capital.* Washington, D.C.: The Urban Institute Press, 1981.

King, Mervyn A. *Public Policy and the Corporation.* London: Chapman and Hall, 1977.

King, Mervyn A. and Don Fullerton (Eds.), *The Taxation of Income from Capital: A Comparative Study of the U.S., U.K., Sweden, and West Germany.* Chicago: The University of Chicago Press, 1984.

Lindsey, Lawrence B. and John F. Navratil. "Rate Reductions and Revenue Responses: Evidence from 1982." mimeo, Harvard University, 1985.

McLure, Charles E., Jr. *Must Corporate Income be Taxed Twice?.* Washington, D.C.: Brookings Institution, 1979.

McLure, Charles E., Jr. "Rationale Underlying the Treasury Proposals." In Federal Reserve Bank of Boston Conference Series No. 29. *Economic Consequences of Tax Simplification,* 1986.

Miller, Merton. "Debt and Taxes." *Journal of Finance* 32 (1977), pp. 261-75.

Poterba, James M. and Lawrence H. Summers. "Dividend Taxes, Corporate Investment, and 'Q'." *Journal of Public Economics* 22 (1983), pp. 135-67.

Poterba, James M. and Lawrence H. Summers. "The Economic Effects of Dividend Taxation." In Edward I. Altman and Marti G. Subrahmanyam (Eds.), *Recent Advances in Corporate Finance.* Homewood, IL: Richard D. Irwin, 1985.

Slemrod, Joel. "The Impact of Tax Reform on Households." In Federal Reserve Bank of Boston Conference Series No. 29. *Economic Consequences of Tax Simplification,* 1986.

U.S. Department of the Treasury. *Tax Reform for Fairness, Simplicity, and Economic Growth.* Washington, D.C.: Government Printing Office, 1984.

The White House. *The President's Tax Proposals to the Congress for Fairness, Growth, and Simplicity.* Washington, D.C.: Government Printing Office, 1985.

# 7 THE TREASURY DEPRECIATION MODEL

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## I. INTRODUCTION

Depreciation reform was a controversial issue during the tax reform debate with numerous depreciation systems proposed. The debate over depreciation concentrated primarily on the proper balance between lower statutory rates and greater depreciation allowances, and secondarily on improvements in the measurement of income through both more realistic measures of depreciation and adjustments for inflation. The principal model the Office of Tax Analysis used to evaluate the revenue consequences of depreciation proposals was the Treasury Depreciation Model.

For any proposed tax system the depreciation model calculates depreciation deductions based on investment estimates by type of asset within a set of industries. These estimates enable the model to operate between the micro level of the firm, where investment is difficult to forecast, and the macro level, where detail is inadequate to evaluate alternative tax proposals. The investment estimates are derived primarily from data on investment by industry and type of asset for 1970 through 1985 from the Bureau of Economic Analysis (BEA). The BEA data are modified for use in the depreciation model to exclude investment that is not eligible for depreciation, to extrapolate investment to 1992, to allocate investment to depreciation categories, and to allocate investment to the corporate and non-corporate sectors. The model currently considers 72 assets in 55 industries.

Although these investment estimates provide the basic data to the model, they must be supplemented by other data to calculate changes in deductions and tax revenues. For example, tax return data from the IRS Statistics of Income are used to estimate the amount of investment depreciated by each depreciation method and the amount of tentative depreciation and investment credit changes carried back or forward as a result of inadequate taxable income.

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To compute total changes in calendar year tax liabilities as a result of alternative depreciation proposals, the model calculates the change in depreciation claimed in the current year by adding to the tentative current change the carryforward deductions from prior years, subtracting the amounts not usable in the current year and adding the amounts carried back to prior years. Calendar year tax liabilities are then computed by multiplying the change in deductions for the year by each sector's effective tax rate (calculated from both statutory tax rates and simulations of the Treasury's corporate tax model) to determine the relationship between depreciation deductions and taxable income. The depreciation model also computes the investment tax credit (ITC) claimed for each year in the simulation period, including the interaction of depreciation deductions and ITC carrybacks and carryforwards.

The depreciation model was used to estimate the revenue effect of the changes in the ITC and depreciation provisions under the Tax Reform Act of 1986. The Act generally repealed the ITC for equipment, which under prior law generally was 10 percent of qualified investment. In addition to repealing the ITC, the Act reduced the amount of tax credits that could be carried over to future years. The Act changed the provisions governing depreciation allowances by replacing the six recovery period classes under prior law with eight classes–six for personal property and two for real estate. The Act also modified expensing provisions.

Based on the Administration's August 1986 investment forecast, the model shows that the changes in the ITC and depreciation would increase calendar year tax liabilities by approximately $256 billion through 1992. After certain "off model" adjustments, the estimates were approximately $260 billion over this calendar year period and about $231 billion over the fiscal year period ending with fiscal year 1992.

The results described in this paper illustrate one use of the depreciation model–estimating the revenue effect of a change in the tax law over a certain period of years. The model is also used to devise depreciation proposals with a targeted revenue cost, which may then be evaluated for their reduction in the cost of capital (see Chapter 5). Alternatively, a proposal that meets a given cost of capital objective can be evaluated for its revenue consequences. Finally, a joint goal for the cost of capital and revenue cost could be specified and depreciation proposals devised to achieve that goal.

The remainder of this paper is organized as follows. Section II describes the changes in the investment tax credit and depreciation provisions under the Tax Reform Act of 1986. Section III continues with a description of the data used by the depreciation modeling system; section IV addresses the actual model in some detail. Finally, section V presents the model's estimated revenue effects from simulating the tax reform changes in depreciation allowances and investment tax credits and discusses the results.

## II. A DESCRIPTION OF ITC AND DEPRECIATION CHANGES

This section describes the changes in the investment credit and depreciation provisions under the Tax Reform Act of 1986 that were evaluated in part by the use of the depreciation model. Each change is discussed in the order it was evaluated by the model: (1) repeal of the ITC for equipment; (2) reduction of carryforwards of investment tax credits; (3) changes in expensing; and (4) changes in the depreciation provisions.

Prior to the Tax Reform Act a 10 percent ITC was generally allowed for investment in new equipment (and used equipment up to $125,000). Short-lived equipment in the 3 year Accelerated Cost Recovery System (ACRS) depreciation class was permitted a 6 percent credit. Assets that took more than one year to construct could receive credits on qualified progress expenditures (QPE's) made during the period of construction before the asset was completed and placed in service. After 1982 the basis against which depreciation allowances were permitted was adjusted down by one-half of the investment credit earned unless the credit percentage was reduced by two percentage points. Investment in buildings was not allowed an investment credit.

The Tax Reform Act of 1986 abolished the ITC after December 31, 1985, unless transition rules apply. Some property will continue to receive the investment credit for various periods through 1990 depending upon the asset depreciation range (ADR) life of the asset, provided it satisfies certain binding contract criteria or was specifically identified in the Act as transition property. The depreciable basis of assets that qualify for transition treatment are reduced by the full amount of the credit and continue to use pre-reform depreciation schedules.

Accompanying repeal of the investment credit is the elimination of basis adjustments to depreciable assets associated with investment credits and the reduction of carryforwards of investment credits. Under prior law, investment credits not usable in the current year because of inadequate tax liability were carried back 3 years and forward 15 years. Under the Tax Reform Act, tax credits carried forward from prior years and newly earned credits are allowed in full for 1986, but are reduced by 17.5 percent in 1987 and by 35 percent after 1987.

The Tax Reform Act also changed expensing provisions. Under prior law $5,000 of investment could be directly expensed (i.e., deducted in full) in 1986. This amount was scheduled to increase to $7,500 in 1988 and to $10,000 in 1990 and thereafter. The new law expands the amount eligible for expensing to $10,000 in 1987, subject to certain restrictions. The restrictions generally limit the amount expensed to taxable income derived from any trade or business. Thus, expensing deductions cannot be used to offset income from other sources. Also, the $10,000 deduction is reduced dollar for dollar as the amount of annual investment exceeds $200,000.

The Tax Reform Act also replaced the prior ACRS depreciation system with a new depreciation system. The prior ACRS system depreciated assets over 3, 5, 10, 15 and 19 years. Assets in 3, 5. 10 and 15 year classes were depreciated by a method similar to 150 percent declining balance (DB) with an switch to straight line to maximize depreciation allowances. Low-income housing and assets in the 19 year class were depreciated at 200 percent and 175 percent DB, respectively, with a switch to the straight-line method to maximize the present value of depreciation deductions.

The new depreciation system uses 200 percent DB for assets in the 3, 5, 7 and 10 year classes and 150 percent DB for assets in the 15 and 20 year classes with an optimum switch to straight line to maximize depreciation allowances. Real estate is depreciated using the straight-line method over 27.5 years for residential real estate and over 31.5 years for other real estate. The new system applies in 1987, but is optional for assets placed in service between July 31 and the end of 1986. The ADR midpoint life primarily determines the assignment of property to a class as follows:

| New Life | For ADR Lives |
|---|---|
| 3 | 4 or less |
| 5 | 4.5 to 9.5 |
| 7 | 10 to 15.5 |
| 10 | 16 to 19.5 |
| 15 | 20 to 24.5 |
| 20 | 25 or more |

However, certain equipment is treated differently. Autos and light trucks, research and experimentation property, and certain technological property are placed in the 5 year class. Other assets are assigned new ADR lives by statute. Assets without ADR midpoint lives are treated as 12 year ADR midpoint life assets. The Appendix contains a more detailed comparison of pre-reform and reform depreciation systems according to ADR midpoint life and asset type or industry where applicable.

The Tax Reform Act of 1986 provides an alternative depreciation system for property used predominantly outside the United States, for determining the proportion of property financed by tax-exempt bonds, and for computing earnings and profits and depreciation for minimum tax purposes. The alternative depreciation system uses the ADR midpoint life and is 40 years for structures and 27.5 years for low-income housing financed with tax-exempt bonds and the straight-line method (except for purposes of the minimum tax). The minimum tax allows the 150 percent declining balance method switching to the straight-line method for property other than real property, which continues to use the straight-line method.

Under prior law several alternative tax systems applied. The minimum tax did not apply to depreciation on ACRS personal property. However, for real property straight-line depreciation was required for minimum tax purposes over the applicable ACRS life of 15, 18 or 19 years. Leased property was required to use the straight-line method over the somewhat longer tax lives of 5, 8, 15 and 22 years for personal property and 40 years for real property except low income housing which used 18 years. Property placed in service abroad was able to use the double declining balance depreciation method with an optimum switch to the straight-line method over the ADR midpoint life for equipment. Real property placed in service abroad was limited to 150 percent declining balance with a switch to straight line over 35 years. For computing earnings and profits the straight-line method applied to the longer tax lives of 5, 12, 25 and 35 years for equipment and 40 years for real property.

## III. A DESCRIPTION OF THE DATA

This section discusses the data inputs for the depreciation model. The model processes: (a) investment data disaggregated by industry, asset type, and asset depreciation range (ADR) and (b) other data which supplements the investment data to enable calculation of revenue effects.

### A. The Investment Data File

The investment data file is the basic data for the depreciation model. The Office of Tax Analysis (OTA) created this file from investment data supplied by Bureau of Economic Analysis (BEA). This process consisted of four steps: (a) adjusting the investment data to investment allowed tax depreciation, (b) extrapolating the data through 1992, (c) mapping the BEA industries and asset classes into OTA industries and asset classes, and (d) splitting the data file into a corporate and non-corporate sector. The subsections below provide background about the BEA data file and describe each step of the process used to create the investment data file. A detailed discussion of BEA's estimation procedure is contained in Gorman, et.al. (1985).

### B. The BEA Data

The BEA investment estimates by industry were obtained from three major sources. The first data source, BEA's plant and equipment expenditure survey, provides annual data on investment in nonresidential capital by nonfarm industries. These data are classified on a company basis and provide a two-way split by type of asset: total equipment and total structures. The second source of information is on investment in structures and durable equipment by sector (mining, construction, manufacturing, etc.), which is collected by the Census Bureau. These data are available every five years. The third source of data is the capital flow tables prepared by BEA from input-output tables for

1963, 1967, and 1972, which provide distributions of investment by asset for each industry. In those instances where data were nonexistent, adjustments were made using interpolation and extrapolation procedures calibrated to established benchmarks.

The investment flows were derived for investment in new capital by type of asset for each industry and for transfers of used assets between private business and other types of owners. The flows for each industry for investment in new and used assets were distributed by legal form of organization.

The BEA data provides estimates of investment by industry and by type of asset for 1970 through 1985. For years following 1985, investment was calculated from detailed industry growth rates obtained from long-term forecasts by Data Resources, Inc. (DRI).

## C. The Data Adjustment Process

In order to use the BEA data to compute tax depreciation, several adjustments were required. In order to concentrate on depreciation deductions of taxable firms, all tax-exempt co-operatives were removed (rural electric power, telephone and wholesale trade). Similarly, all investments of non-profit institutions were removed from the real estate industry. (BEA classified these investments in the real estate industry in order to maintain consistency with the National Income and Product Accounts, NIPA). Non-depreciable oil wells, gas wells, and mine shafts were removed from their corresponding industries. The assets of Federal Reserve Banks are also removed since they do not pay income tax.

A time series for used investment was created using basic scrap equations found in Winfrey (1935). Adjustments were made for replacement railroad tracks and major structural improvements. Special purpose agriculture structures, railroad tank cars, public utilities, coal fired burners, and other asset types were also adjusted to achieve benchmark targets.

These adjustments to the BEA data produced the basic data for the depreciation model.

## D. Extrapolation

The BEA data file provides data for the years 1970 through 1985. Since the depreciation model must simulate proposals for 1981 through 1992, the years beyond 1985 were extrapolated in two steps: (a) investment was grown from 1986 through 1992 based on estimated growth rates for each industry from DRI, and (b) the data was subsequently scaled to conform with the Administration's forecast for gross private domestic investment in producers durable equipment, residential structures, and non-residential structures. This extrapolation procedure provides a consistent basic data set that covers the years for which revenue estimates are calculated.

## E. Mapping

Mapping of industries and asset classifications is required because BEA industries and asset classifications are not the same as those used by OTA. Since BEA uses more detailed industries than OTA, the 61 BEA industries were mapped into 55 industry classifications used by OTA. ADR mapping also is necessary because not all of the investment attributed to each of BEA's 65 asset types corresponds to one and only one ADR classification. Consequently, the investment in certain asset types are allocated among several different ADR classes depending on the asset type and industry. Investment in other asset types are allocable to one and only one ADR class.

## F. The Corporate/Individual Split

The investment data file was split into two separate data files, for the corporate and individual (non-corporate) sectors, so that revenue estimates could be calculated for each sector. The investment data file was split by computing the percentage of total investment by industry that is non-corporate and applying that percentage to the investment in each asset within the industry. This percentage is the weighted sum of the percentage of non-corporate investment in equipment and structures obtained from statistics of income data.

## G. Other Data Inputs

Although the adjusted investment data file provides the basic information needed for the computation of tax depreciation, it is incomplete and must be supplemented by data from other sources. For example, it does not contain the amount of investment that received straight line depreciation or sum of the years digits, or the amount of depreciation deductions claimed for the current year or deductions carried forward to future years. The corporate tax model with published corporate statistics of income (SOI) data was used either to extract, or where necessary, generate the additional data in a form that could be used with the investment data. These data include:

° Percent of corporate and non-corporate investment qualifying for bonus depreciation by industry. These amounts are used to determine the amount of corporate and non-corporate investment that is expensed, respectively.
° Growth factors to inflate or deflate expensing and bonus depreciation. These data are used to estimate real growth in the number of businesses by industry and year.
° Depreciation deductions on structures "in place" as of 1981 estimated through 1992 for each industry. These amounts are added to new depreciation to yield total depreciation.

- Depreciation deductions on equipment "in place" as of 1981 estimated through 1992 for each industry. These amounts are added to new depreciation to yield total depreciation.
- Interpolation parameters (by percent change in depreciation) by industry for the a) effective tax rate; b) percentage of depreciation deductions in net operating losses (NOL); and c) ratio of tentative ITC to claimed ITC.
- Percentage of carryback and carryforward that apply to the ITC computations.
- Percentage of NOLs carried back and forward that apply to the depreciation computations.

These additional data complete the input data used in the current version of the depreciation model.

## IV. A DESCRIPTION OF THE SIMULATION MODEL

This section summarizes the operation of the depreciation model program. The first subsection highlights the functional operation of the model. A subsection follows that provides a more detailed explanation of selected computations. The last subsection illustrates how the depreciation model is used with other modeling systems to expand the capabilities of those systems.

### A. The Simulation Process

The data for each asset in each industry is processed for each year in the simulation for present law (Plan X) and proposed law (Plan Y). For each plan, the model computes by year an investment tax credit and depreciation deductions by proceeding through the following steps:

- The asset tax classification is determined.
- Transition rules are applied, if applicable.
- Expensing is computed and, if appropriate, the expensed amount is subtracted from the cost of property to obtain the adjusted basis.
- The allowable investment tax credit is computed and, if appropriate, the adjusted basis is modified again.
- Regular depreciation deductions are computed for investment that does not receive straight line.
- Straight-line depreciation deductions are computed for investment that is eligible for and chooses to use straight line.

The results are summed for each industry across all asset classifications to obtain total investment, total depreciation, and total "tentative" investment tax credit for the industry by year.

Next, the difference between present law and proposed law depreciation deductions and ITC and the corresponding difference in calendar year tax liabilities and fiscal year receipts are computed. (These computations are described in greater detail later in the subsection on credit computations.) The industry results are available for the corporate sector, non-corporate sector, and both sectors combined.

## B. Explanations of Selected Computations

This section provides detailed explanations of the model's computations for expensing, qualified progress expenditures, tax liability, and tax credits.

### 1. Expensing

A firm can elect to deduct the cost of property up to some maximum in the year the property is placed into service in lieu of recovering the cost under the depreciation rules currently in effect. Only personal property is eligible for expensing. Because the investment data was collected by industry and expensing rules apply to the firm, a procedure was developed to estimate expensing on a industry basis for both the corporate and non-corporate sectors.

Corporate tax model simulations were performed to determine, by industry, the percentage of cumulative investment less than or equal to expensing limits in $5,000 increments up to $50,000. Similar simulations were also performed using the sole proprietorship file to obtain percentages for the non-corporate sector. These percentages, applied to the investment across an industry in a given sector for a specific expensing limit, yield an estimate of expensing. Based on the results of regressions, allowances were made to expensing for the growth in the number of business over time.

### 2. Qualified Progress Expenditures

Qualified progress expenditures (QPE) are calculated so that their associated ITC can be computed. By looking ahead in the time series, the amount of investment that will be put in place in the future is distributed backwards through time (the construction period) according to an industry-specific pattern. The industries that are affected by qualified progress expenditures rules are chemical and petroleum refining equipment, coal and non-nuclear power plants, and nuclear power plants.

Table 7.1 provides an example of this estimation method for QPEs for chemical and refining equipment. It is assumed that QPEs in the current year are 34 percent of total investment and that this amount was actually spent over the prior 4 years of the construction period. The pattern of this distribution assumes that 7 percent of the cost occurred one year ago, 20 percent two years ago, 48 percent three years ago, and 25 percent in the first year of the construction (four years ago). Once these computations have been completed, the qualified progress expenditures for each year of the simulation

Table 7.1 **Assumptions Underlying Qualified Progress Expenditures**

| | Number of Years Past | Chemical Refining Equipment[a] | Coal and Non-Nuclear Power Plants[a] | Nuclear Power Plants[b] |
|---|---|---|---|---|
| Construction period | | 4.00 | 7.00 | 11.00 |
| Total QPE as a percent of current year investment | | 34.00 | 30.28 | 30.28 |
| | 1 | 7.00 | 4.00 | 16.00 |
| | 2 | 20.00 | 14.00 | 14.00 |
| | 3 | 48.00 | 33.00 | 12.00 |
| | 4 | 25.00 | 34.00 | 12.00 |
| | 5 | | 11.00 | 11.00 |
| | 6 | | 3.00 | 11.00 |
| | 7 | | 1.00 | 12.00 |
| | 8 | | | 6.00 |
| | 9 | | | 4.00 |
| | 10 | | | 1.00 |
| | 11 | | | 1.00 |

[a] CONCEPT-5, Oak Ridge National Laboratories, Phase VI Update (1983) Report for the Energy Economic Data Base Program, EEDB-VI, September, 1984.

[b] Based on Energy Information Form 254 and Federal Energy Regulatory Commission Form 1. The data are based on a specific 1120 megawatt pressurized-water reactor unit that is considered to be representative of nuclear units.

are summed so that the series will be available for the computation of the investment tax credit.

The same procedure is applied to the other eligible industries. Since the construction period for nuclear power plants is 11 years, the computations cover the period 1971 (1982, when QPE rules were enacted, minus 11 years) to 2006 (1995, the last year the model estimates, plus 11 years). In years where no actual investment data exists, data was generated by assuming that investment continues to grow at the same rate exhibited by the last two periods of actual data.

### 3. Tax Computations

For each industry the depreciation model computes the following changes for each year in the simulation:

- Tentative total depreciation,
- Tentative current year depreciation,
- Tentative deductions carried back,
- Tentative deductions carried forward.
- Claimed total depreciation,
- Claimed current year depreciation and deductions carried back,
- Claimed deductions carried forward,

° Outstanding carryforward (NOL).
° Calendar year tax liability, and
° Fiscal year receipts.

To compute these changes, summations are required for total depreciation deductions under present law (Plan X) and under proposed law (Plan Y). The tax calculator begins by computing the tentative change in depreciation as the difference between Plan Y and Plan X depreciation deductions. In-place depreciation for equipment and structures is added to present law depreciation to yield total present law depreciation.

Next, the model computes the percentage change in depreciation deductions with respect to total present law depreciation. Both the percentage change in depreciation deductions and industry classification are used to determine three exogenous tax parameters: (a) the effective corporate tax rate for depreciation deductions, (b) the percent of total depreciation deductions in NOLs, and (c) the ratio of claimed ITC to tentative ITC (used in the computation of tax credits). These tax parameters are used to calculate the change in current year depreciation deductions and to allocate the total depreciation change between current year deductions and additions to carryback and carryforward deductions. Tentative changes are computed in four steps.

First, the tentative change in current year taxable income is computed by multiplying the total change in depreciation deductions by one minus the percent of total depreciation deductions in NOLs. Second, the tentative change in carryback deductions is computed by multiplying the tentative change in NOLs by the percentage of NOLs carried back (obtained from data extracted from the corporate SOI). Third, the tentative change in carryforward deductions is a residual obtained by subtracting the tentative change in carryback deductions from the tentative change in NOLs.

The change in current year taxable income is computed as the sum of the tentative change due to current year depreciation deductions, the tentative change in carryback deductions, and the claimed change in carryforwards from prior years (accumulated during prior years of the simulation). For each year remaining in the simulation, the claimed change in carryforward deductions is computed by multiplying the tentative change in NOLs by the percentage of NOLs carried forward. These carryforwards are accumulated for each year remaining in the simulation so that claimed carryforwards will already be computed when the simulation reaches a future year.

Calendar year tax liabilities are computed by sector because effective tax rates differ by sector. The effective corporate tax rates are adjusted for the rate reductions enacted in the Tax Reform Act of 1986 by simple proportional adjustment. Thus, the corporate tax rate (derived from corporate tax model simulations) is multiplied by (0.40/0.46) for 1987 and by (0.34/0.46) for 1988 and the years that follow. The individual tax rates are computed as a base rate adjusted to reflect bracket creep that existed prior to indexing enacted under the Deficit Reduction Act. In addition, the individual tax rates were adjusted further to capture the rate reductions enacted by the Economic Recovery Tax Act. Changes in tax liabilities are then computed by multiplying the change in deductions claimed by the effective tax rate for the appropriate sector.

### 4. Credit Computations

Following the tax computations, the depreciation model computes the ITC for each year in the simulation. The model computes the following changes:

- Tentative total ITC,
- Tentative current year ITC,
- Tentative ITC carried back,
- Tentative ITC carried forward,
- Claimed total ITC,
- Claimed current year and carryback ITC,
- Claimed ITC carried forward,
- Outstanding carryforward,
- Calendar year tax liability, and
- Fiscal year receipts.

The procedure for these calculations is similar to that for the tax computations for changes in depreciation. Consequently, it will not be discussed further here except to note two differences. First, the allocation of tentative total ITC to carryforward and carryback credits is more complicated than the same computation for depreciation deductions because the model must account for the fact that a change in gross tax will change ITC carried back or forward. In other words, if the ITC does not change between present and proposed law but depreciation deductions do change, then more or less ITC will be carried back or forward. Second, the tax liability computation is different because ITCs are applied directly against tax.

## C. Relationship to Other Models

### 1. Corporate Model

The depreciation model is used to supply three categories of data to assist simulations made with the corporate model: (a) estimates that adjust depreciation deductions by industry on the corporate SOI file, (b) computations of preference amounts that are allocated to corporate returns for computing the alternative minimum tax, and (c) estimates that are used to construct an earnings and profit (E&P) net depreciation adjustment for 1990 and beyond.

For the regular tax, depreciation in the corporate tax model is recomputed by multiplying the base year depreciation by an adjustment ratio. This ratio is the target depreciation, as estimated by the depreciation model, divided by the total base year depreciation on the corporate data base.

For the alternative minimum tax under the Tax Reform Act (TRA), two simulations using the depreciation model are required to produce the appropriate estimates. The first simulation yields depreciation claimed under the TRA for assets put in place after the law becomes effective; the second simulation produces the minimum depreciation generated by these assets.

The adjustment for earnings and profit depreciation requires a series of depreciation model simulations to capture the nuances of the interactions of book income and taxable income within the depreciation system.

### 2. Supplemental Model

The results of the depreciation model are adjusted using a supplemental model to take into account changes in the tax treatment of research and development property. The adjustment provided by this model is described in detail in section V.B.

## V. RESULTS OF SIMULATING THE EFFECTS OF TAX REFORM

This section discusses one use of the depreciation model: determining the revenue effects of changes in depreciation allowances and investment tax credits in the Tax Reform Act of 1986.

## A. Simulation Results

The depreciation model evaluated reform proposals in the following order: repeal of the investment tax credit, reduction in existing investment credits, changes in expensing, and changes in depreciation. The order of consideration affects the revenue estimate for a particular provision. For example, the revenue estimate for changes in expensing is different if it is considered before rather than after depreciation provisions. The "stacking order" followed for the Tax Reform Act estimates was statutory tax rate reduction first, followed by investment credit repeal, reduction in existing credits, increase in expensing, and depreciation changes. Stacking order issues are discussed in Nester "Interpreting Revenue Estimates: Macro-Static Micro-Dynamic" in Chapter 1 of this volume. The effect of general rate reduction, which is considered before depreciation and investment credit provisions for revenue estimating purposes, is not discussed here. In addition, the effect of other provisions which were stacked later, such as the minimum tax, are not described here.

### 1. Summary

The revenue estimates produced by the depreciation model after adjustments are summarized in Table 7.2. The tax reform changes in the ITC and depreciation increase calender year tax liabilities by $260 billion through

Table 7.2 **Revenue Changes From The Capital Cost Recovery Provisions in The Tax Reform Act of 1986, 1986 – 1992***

| | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1986-1992 |
|---|---|---|---|---|---|---|---|---|
| | | | | ($ Millions) | | | | |
| Individual | 3,320 | 3,802 | 5,332 | 6,729 | 9,080 | 11,807 | 13,138 | 53,208 |
| Corporate | 10,533 | 15,069 | 22,408 | 29,452 | 36,880 | 46,254 | 46,358 | 206,954 |
| Total | 13,853 | 18,870 | 27,741 | 36,181 | 45,961 | 58,062 | 59,496 | 260,163 |

*These estimates may differ from other published estimates, because they are based on a different economic forecast and include only selected capital cost recovery provisions.

calendar 1992. Calendar year liabilities increase from $13.9 billion in 1986 to $59.5 billion in 1992 as transition provisions phase out, the economy grows, and a larger fraction of investment becomes eligible for the new depreciation schedules.

The change considered first, investment credit repeal, provides revenue increases roughly proportional to investment in equipment. The changes considered second and third, the reduction in existing credits and increases in expensing, have relatively small effects concentrated in the early years. Depreciation provisions, which were considered last, first reduce and then increase revenue after a few years as the revenue increase from the less rapid depreciation schedules for structures overtakes the revenue loss from the more rapid depreciation schedules for equipment.

Results of the depreciation model are adjusted to produce the final set of revenue estimates. These adjustments take into account current data for the 35 percent cutback of ITCs, the elective 15 year carryback for certain taxpayers, the treatment of R&D property, and recapture provisions for auto and truck leasing. These adjustments are necessary to produce a final set of revenue estimates for the tax reform proposals. Several adjustments made using the supplemental model are described in section B.

2. Investment Credit Repeal

The first change evaluated by the model is repeal of the investment tax credit. Tentative investment credits before reform are calculated according to the classification of the asset. Three-year property receives a 6 percent investment credit and longer lived personal property receives a 10 percent credit unless the property is expensed.

The translation of tentative credit changes to actual tax changes requires adjustments for the interaction of credits with depreciation and adjustments for restrictions on the use of credits and deductions. The computation of revenue changes associated with repeal of the investment credit is described in more detail below.

The baseline investment series for 3, 5, 10, and 15 year personal property eligible for the credit under prior law for calendar years 1986 through 1992 is shown on Table 7.3. Within each asset class the amount of investment is shown that is adjusted in basis for investment credits, is expensed, is allowed ACRS depreciation, and selects straight-line depreciation. Investment expenditures fall primarily in the 5 and 19 year classes. For 1986, $284 billion or 49 percent of investment was accounted for by 5 year equipment. Buildings, which received a 19 year depreciation period, accounted for $153 billion or 27 percent of total investment. Based on the estimates of investment shown on Table 7.3, the model calculates tentative depreciation deductions before repeal of the investment credit. These estimates for calendar years 1986 through 1992 are shown on Table 7.4.

Table 7.5 summarizes the computation of actual tax changes from repeal of the investment credit and shows the total change in calender year liabilities and fiscal year receipts. These totals include various interactions between credits, depreciation allowances and the other tax provisions shown on the table. After a presentation of total investment for reference in lines 1 to 3 of Table 7.5 and total tentative depreciation deductions in the base and revised cases in lines 4 and 5, respectively, the differences in tentative depreciation deductions from repeal of the ITC are presented in line 6. Tentative depreciation deductions increase by approximately $16 billion per year by 1992 from the elimination of the basis adjustment.

Based on simulations of the corporate tax model, the tentative depreciation allowance change is divided into three parts: the portion used in the current year, the portion carried back to one of the previous three tax years, and the portion carried forward to future years. Because some deductions not usable against current year tax liability (carrybacks) are assumed to reduce tax liability for a prior year, any permissible reduction in prior year tax liability from the carryback is a reduction in tax liability affecting Federal government revenue for the current year. These current and carryback deductions from lines 7 and 8 are totaled in line 11. The third portion of depreciation deductions, the position that cannot be used currently or carried back to a prior year due to inadequate tax liability, is carried forward to a future year, perhaps to be usable later as a carryforward (line 9).

Line 12 takes into account the stock of net operating loss carryforwards that some firms have from the past that are usable in the current year. Thus, the current year change shown in line 10 is the sum of current and carryback use of currently earned tentative depreciation deductions plus the amount of carryforwards from previous years used in the current year. The change in the stock of outstanding carryforwards of net operating losses maintained by the model is presented in line 13.

The "bottom line" effect on tax receipts of depreciation related changes induced by repeal of the investment credit is presented in line 14 by calendar year and in line 15 by fiscal year. The tax rate applicable to depreciation allowances is calculated by the model from the basic statutory rates of 40

## Table 7.3 Total Investment by ACRS Depreciation Class Before TRA 86, 1986-1992

| ACRS Class | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|
| | | | ($ Millions) | | | | |
| 3 Year Personal Property | | | | | | | |
| Basis Adjustment | 1,319 | 1,460 | 1,638 | 1,928 | 2,156 | 2,341 | 2,546 |
| Expensing | 1,606 | 1,616 | 2,466 | 2,652 | 3,268 | 3,273 | 3,288 |
| Regular | 63,187 | 69,711 | 78,161 | 91,889 | 102,739 | 111,542 | 121,252 |
| Straight Line | 2,292 | 2,528 | 2,835 | 3,333 | 3,726 | 4,046 | 4,398 |
| 5 Year Personal Property | | | | | | | |
| Basis Adjustment | 7,834 | 8,807 | 9,934 | 11,634 | 13,071 | 14,353 | 15,282 |
| Expensing | 6,039 | 6,187 | 9,461 | 10,144 | 12,596 | 12,843 | 13,129 |
| Regular | 260,463 | 292,510 | 329,779 | 387,067 | 436,020 | 480,215 | 529,839 |
| Straight Line | 9,447 | 10,609 | 11,961 | 14,039 | 15,814 | 17,417 | 19,217 |
| 10 Year Personal Property | | | | | | | |
| Basis Adjustment | 296 | 328 | 366 | 412 | 451 | 489 | 207 |
| Expensing | 10 | 10 | 15 | 16 | 19 | 19 | 20 |
| Regular | 11,012 | 11,801 | 12,784 | 14,037 | 15,174 | 16,352 | 18,099 |
| Straight Line | 399 | 428 | 465 | 509 | 550 | 593 | 656 |
| 15 Year Personal Property | | | | | | | |
| Basis Adjustment | 813 | 908 | 1,011 | 1,160 | 1,282 | 1,378 | 959 |
| Expensing | 12 | 12 | 19 | 20 | 24 | 24 | 25 |
| Regular | 27,426 | 30,033 | 33,240 | 38,090 | 42,068 | 45,238 | 49,617 |
| Straight line | 995 | 1,089 | 1,206 | 1,382 | 1,526 | 1,641 | 1,800 |
| 15 Year Real Property Except Low Income | | | | | | | |
| Basis Adjustment | 95 | 0 | 0 | 0 | 0 | 0 | 0 |
| Expensing | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Regular | 11,967 | 0 | 0 | 0 | 0 | 0 | 0 |
| Straight Line | 8,974 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 Year Real Property Low Income | | | | | | | |
| Basis Adjustment | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Expensing | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Regular | 6,737 | 7,483 | 8,282 | 9,015 | 9,708 | 10,582 | 11,520 |
| Straight Line | 237 | 264 | 292 | 318 | 342 | 373 | 406 |
| 19 Year Real Property | | | | | | | |
| Basis Adjustment | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Expensing | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Regular | 88,335 | 110,392 | 122,234 | 133,177 | 144,435 | 157,944 | 172,574 |
| Straight Line | 64,758 | 80,633 | 89,173 | 97,077 | 105,453 | 115,342 | 126,089 |
| Total | 574,254 | 636,809 | 715,320 | 817,898 | 910,419 | 996,004 | 1,090,932 |

Table 7.4 **Total Deductions by ACRS Depreciation Class Before TRA 86, 1986-1992**

| ACRS Class | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|
| | | | ($ Millions) | | | | |
| 3 Year Personal Property | 56,162 | 57,518 | 62,340 | 70,327 | 80,411 | 89,722 | 97,899 |
| 5 Year Personal Property | 242,233 | 257,821 | 285,559 | 315,311 | 354,163 | 399,006 | 447,296 |
| 10 Year Personal Property | 5,899 | 7,077 | 8,335 | 9,730 | 11,250 | 12,100 | 13,144 |
| 15 Year Personal Property | 10,146 | 12,255 | 14,575 | 17,206 | 20,200 | 23,392 | 26,841 |
| 15 Year Real Property Except Low Income | 37,566 | 35,259 | 32,505 | 30,301 | 28,679 | 27,084 | 25,721 |
| 15 Year Real Property Low Income | 2,669 | 3,222 | 3,793 | 4,402 | 5,033 | 5,699 | 6,416 |
| 19 Year Real Property | 15,614 | 27,554 | 40,859 | 54,700 | 68,996 | 83,878 | 99,617 |
| Total | 370,290 | 400,706 | 447,966 | 501,977 | 568,732 | 640,881 | 716,933 |

percent in 1987 and 34 percent thereafter with adjustments to these statutory tax rates calculated within the model based on the results of simulations of the corporate model. Fiscal year receipts are calculated from the calendar year figures from a rule of thumb division of calendar year liabilities between fiscal years. All amounts are calculated for the corporate and non-corporate sectors separately and aggregated to the totals presented. A similar set of calculations is then performed by the model for investment credit changes, shown starting on line 16. The difference between baseline and tax reform tentative investment credits in lines 16 and 17 is presented in line 18 as the tentative change. The portions of the tentative change used in the current year or carried back to one of the previous three years shown in lines 19 and 20 are summed in line 23. The portion of the outstanding investment credit carried forward from previous years shown in line 24 is added to determine the actual change in line 22. The stock of outstanding carryforward is adjusted for the difference between past carryforward used or lost and current year additions to the carryforward in line 25. Changes in fiscal year receipts in line 27 are calculated from calendar year receipts in line 26.

The total change in line 28 is the sum of depreciation induced changes in tax liability in line 14 and investment credit changes in tax liability in line 26. Similar sums are calculated for fiscal year receipts in lines 15, 27, and 29. The total tentative revenue change in investment credits through 1992 of $337 billion becomes a $230 billion dollar change after carryforwards, carrybacks and associated depreciation adjustments. These are the amounts associated with repeal of the investment credit before the reduction in investment credits that will be discussed next.

3. Reduction in Investment Credits

The second set of tax reform changes evaluated by the depreciation model is the reduction in investment credits allowed. Investment credits allowed under

**Table 7.5 Summary of the Effects of the Proposal to Repeal the Investment Tax Credit of TRA 86, 1986-1992***

| | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|
| | | | ($ Millions) | | | | |
| Investment | | | | | | | |
| 1 Total | 574,254 | 636,809 | 715,320 | 817,898 | 910,419 | 996,004 | 1,090,932 |
| 2 New | 494,894 | 551,343 | 618,800 | 707,067 | 783,012 | 849,835 | 924,278 |
| 3 Used | 79,360 | 85,466 | 96,520 | 110,831 | 127,407 | 146,170 | 166,653 |
| Depreciation | | | | | | | |
| 4 Tentative Plan X (ACRS) | 370,290 | 400,706 | 447,966 | 501,977 | 568,733 | 640,881 | 716,933 |
| 5 Tentative Plan Y (Repeal) | 371,940 | 404,797 | 454,406 | 510,939 | 580,531 | 654,835 | 732,674 |
| 6 Tentative Change | 1,650 | 4,091 | 6,440 | 8,962 | 11,799 | 13,954 | 15,742 |
| 7 Current Year | 966 | 2,466 | 3,974 | 5,624 | 7,473 | 8,939 | 10,144 |
| 8 Carryback | 185 | 439 | 666 | 9012 | 1,168 | 1,354 | 1,511 |
| 9 Carryforward | 499 | 1,186 | 1,800 | 2,437 | 3,158 | 3,661 | 4,086 |
| 10 Actual Change | 1,151 | 2,939 | 4,756 | 6,763 | 9,047 | 10,915 | 12,528 |
| 11 Current Year + Carryback | 1,151 | 2,905 | 4,640 | 6,525 | 8,641 | 10,293 | 11,655 |
| 12 Carryforward Used | 0 | 34 | 115 | 239 | 406 | 622 | 873 |
| 13 Outstanding Carryforward (NOL) | 499 | 1,651 | 3,336 | 5,534 | 8,286 | 11,325 | 14,538 |
| 14 Calender Year Tax Liability | -408 | -957 | -1,352 | -1,872 | -2,514 | -3,046 | -3,506 |
| 15 Fiscal Year Receipts | -218 | -699 | -1,168 | -1,643 | -2,222 | -2,806 | -3,297 |
| Investment Tax Credit | | | | | | | |
| 16 Tentative ITC Plan | 36,124 | 40,405 | 45,353 | 52,635 | 58,873 | 64,508 | 63,368 |
| 17 Tentative ITC Plan | 12,110 | 6,057 | 3,608 | 1,322 | 1,119 | 0 | 0 |
| 18 Tentative Change | -24,013 | -34,348 | -41,746 | -51,313 | -57,754 | -64,508 | -63,368 |
| 19 Current Year | -15,155 | -21,824 | -26,791 | -33,219 | -37,486 | -42,222 | -41,110 |
| 20 Carryback | -443 | -626 | -748 | -905 | -1,013 | -1,114 | -1,113 |
| 21 Carryforward | -8,415 | -11,898 | -14,207 | -17,189 | -19,255 | -21,171 | -21,145 |
| 22 Actual Change | -15,598 | -24,665 | -32,530 | -41,201 | -47,874 | -54,578 | -55,034 |
| 23 Current Year + Carryback | -15,598 | -22,450 | -27,539 | -34,124 | -38,499 | -43,336 | -42,223 |
| 24 Carryforward Used | 0 | -2,215 | -4,991 | -7,077 | -9,374 | -11,242 | -12,811 |
| 25 Outstanding Carryforward (ITC) | -8,415 | -18,098 | -27,314 | -37,426 | -47,306 | -57,235 | -65,569 |
| 26 Calender Year Tax Liability | 14,540 | 23,021 | 29,671 | 36,734 | 42,694 | 48,766 | 48,641 |
| 27 Fiscal Year Receipts | 7,937 | 19,194 | 26,796 | 3,747 | 40,055 | 46,110 | 48,484 |
| Total Change | | | | | | | |
| 28 Calender Year Tax Liability | 14,132 | 22,064 | 28,319 | 34,862 | 40,181 | 45,720 | 45,135 |
| 29 Fiscal Year Receipts | 0 | 26,213 | 25,628 | 32,103 | 37,833 | 43,304 | 45,187 |

*These estimates may differ from other published estimates because they are based on a different economic forecast.

transition rules or carried forward from previous years could be used in full in 1986, but were scaled back 17.5 percent for 1987 and 35 percent for 1988 and thereafter. Marginal revenue changes from this provision are calculated by taking the difference between depreciation model runs that add the investment credit cutback provision to the investment credit repeal provision discussed above and the depreciation model run for investment credit repeal alone. This difference is concentrated in calendar years 1987 through 1990 when unused credits are their maximum and some investment credits are being earned on transition property.

4. Increase in Expensing

The Tax Reform Act of 1986 increases expensing of personal property to $10,000 in 1987; under pre-reform law the increase phases in over a 4 year period. The Act also limits the amount eligible to be expensed to taxable income derived form the active trade or business in which the property is used and phases out the ceiling dollar for dollar on taxpayer investment in excess of $200,000. The revenue cost of this provision totals about $5 billion as shown in Table 7.6, concentrated in the early years when current law allows expensing of only $5,000 or $7,500.

Because limitations on expensing take place at the firm rather than industry level, adjustments to the depreciation model for these changes are based on simulations of the corporate tax model to obtain "rules of thumb" cutbacks to apply to expensing.

5. Depreciation Changes

As described in Section II, TRA completely changed the tax treatment of depreciable assets. The ADR system classified assets by their average useful

Table 7.6 **Revenue Estimates for Expensing Provision Changes in TRA86***

| | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1986-1992 |
|---|---|---|---|---|---|---|---|
| Calendar Year Liability | | | | | | | |
| Individual | -1,161 | -586 | -393 | -123 | 5 | -48 | -2,306 |
| Corporate | -1,386 | -641 | -487 | -148 | 7 | -62 | -2,717 |
| Total | -2,547 | -1,227 | -880 | -270 | 12 | -110 | -5,023 |
| Fiscal Year Receipts | | | | | | | |
| Individual | -436 | -946 | -514 | -292 | -75 | -15 | -2,276 |
| Corporate | -831 | -939 | -549 | -283 | -55 | -35 | -2,692 |
| Total | -1,267 | -1,885 | -1,062 | -575 | -130 | -49 | -4,968 |

*These estimates may differ from other published estimates because they are based on a different economic forecast.

life in the hands of the purchaser. Most equipment was classified as 5-year ACRS property under pre-reform law. The Tax Reform Act moves this property primarily into the 5 and 7 year double declining balance classes. Thus, most personal property obtains approximately equal or more rapid depreciation from the tax change because 5-year ACRS depreciation is approximately equivalent to 150 percent declining balance (all with an optimum switch to the straight-line method). The depreciation lives of structures are lengthened from 19 to 27.5 or 31.5 years and their depreciation is reduced from the 175 percent declining balance method to straight line.

The amount of investment in each of the eight new classes is given in Table 7.7 for calendar years 1986 through 1992 using the Administration's August 1986 forecast. The distribution of investment by the new depreciation categories is most clearly seen in 1991 and 1992 when transition treatments have ended. (Transition property is shown as an aggregate rather than by class at the bottom of Table 7.7.) The largest class is 5 year property. The next two largest classes are the real property classes for residential and nonresidential building followed by the 7 year personal property class as the fourth largest investment category.

Total deductions for each class by calendar year are presented in Table 7.8. These deductions when adjusted and converted to tax changes are compared with pre-reform law to obtain the summary of differences in Table 7.9 for the depreciation changes alone.

Table 7.9 shows the effect of two factors on revenue changes associated with depreciation provisions in the Tax Reform Act. First, the more rapid depreciation method for most equipment combined with the large amount of investment in the 5 year class produce a revenue loss for 1987 and 1988 as well as for 1986 (when the new schedules were optional for the last five

Table 7.7 **Total Investment by TRA 86 Depreciation Class, 1986-1992**

| Depreciation Class | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|
| | | | ($ Millions) | | | | |
| Class 1 (3 year) | 40,355 | 13,663 | 15,389 | 17,933 | 20,042 | 21,609 | 23,368 |
| Class 2 (5 year) | 207,128 | 240,314 | 288,544 | 353,903 | 398,487 | 436,010 | 477,113 |
| Class 3 (7 year) | 2,317 | 86,299 | 110,717 | 141,709 | 160,903 | 177,601 | 196,606 |
| Class 4 (10 year) | 11,580 | 5,168 | 6,563 | 8,209 | 9,023 | 9,829 | 10,769 |
| Class 5 (15 year) | 56,351 | 22,521 | 29,780 | 37,020 | 44,196 | 65,340 | 70,989 |
| Class 6 (20 year) | 4,924 | 860 | 1,020 | 1,155 | 1,273 | 1,376 | 1,486 |
| Class 7 (27.5 year) | 45,110 | 67,252 | 75,920 | 82,793 | 89,301 | 97,494 | 106,293 |
| Class 8 (31.5 year) | 0 | 98,307 | 124,744 | 147,032 | 168,550 | 186,746 | 204,306 |
| Transition | 206,490 | 102,425 | 62,642 | 28,143 | 18,645 | 0 | 0 |
| Total | 574,254 | 636,809 | 715,320 | 817,898 | 910,419 | 996,004 | 1,090,932 |

Table 7.8 **Total Depreciation Deductions by TRA 86 Depreciation Class, 1986-1992**

| Depreciation Class | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|
| | | | ($ Millions) | | | | |
| Class 1 (3 year) | 49,630 | 34,429 | 20,619 | 14,776 | 17,369 | 19,225 | 20,917 |
| Class 2 (5 year) | 234,107 | 257,076 | 281,379 | 293,319 | 298,512 | 325,573 | 370,567 |
| Class 3 (7 year) | 5,174 | 21,191 | 44,778 | 69,757 | 94,397 | 116,204 | 138,841 |
| Class 4 (10 year) | 9,306 | 9,577 | 9,882 | 10,479 | 11,325 | 12,150 | 13,082 |
| Class 5 (15 year) | 39,319 | 39,682 | 39,176 | 39,698 | 41,223 | 43,867 | 47,620 |
| Class 6 (20 year) | 2,541 | 2,529 | 2,249 | 2,020 | 1,875 | 1,777 | 1,731 |
| Class 7 (27.5 year) | 11,545 | 13,672 | 15,362 | 17,379 | 19,663 | 22,215 | 25,162 |
| Class 8 (31.5 year) | 0 | 1,560 | 5,083 | 9,341 | 14,246 | 19,717 | 25,676 |
| Prior Year & Transition | 21,280 | 41,679 | 49,327 | 50,004 | 50,695 | 31,581 | 20,733 |
| Total | 372,902 | 421,396 | 467,854 | 506,773 | 549,303 | 592,308 | 664,328 |

Table 7.9 **Revenue Estimates for Depreciation Schedule Changes in TRA 86, 1986-1992***

| | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|
| | | | ($ Millions) | | | | |
| Calendar Year Liability | | | | | | | |
| Individual | -84 | -335 | -362 | 573 | 1,830 | 3,463 | 3,908 |
| Corporate | -312 | -1,356 | -2,126 | -77 | 3,448 | 8,672 | 9,879 |
| Total | -396 | -1,692 | -2,487 | 497 | 5,278 | 12,135 | 13,787 |
| Fiscal Year Receipts | | | | | | | |
| Individual | 0 | -210 | -345 | -11 | 1,045 | 2,443 | 3,630 |
| Corporate | 0 | -1,126 | -1,818 | -896 | 2,038 | 6,583 | 9,396 |
| Total | 0 | -1,336 | -2,163 | -907 | 3,083 | 9,025 | 13,026 |

*These estimates may differ from other published estimates because they are based on a different economic forecast and include only selected capital cost recovery provisions.

months). These revenue losses total about $4.6 billion for the three calendar year period. These effects dissipate with time as smaller depreciation deductions in later years offset faster deductions in earlier years. Second, the large investment category of structures that receive smaller annual depreciation allowances under the Act increase revenue enough over a few years to dominate the revenue reductions on equipment. The revenue loss becomes a half billion dollar gain in 1989 which increases to over $5 billion in 1990. The total estimated revenue gain from the depreciation provisions exceeds $20 billion over the seven year period.

The combined effect of all depreciation and investment credit changes calculated by the depreciation model is presented in Table 7.10 The dominant effect of the repeal of the investment credit insures a revenue gain in all years despite early period losses from increased expensing and depreciation allowances for many assets. These estimated revenue increases total about $231 billion using the post reform statutory tax rates. The Tax Reform Act lowered statutory tax rates which offsets much of this revenue increase.

## B. Adjustments to Depreciation Model Results

Four adjustments to the results from the depreciation model produce the final set of revenue estimates. The first adjustment concerns the 35 percent cutback of investment credit carryforwards which are phased in over a two-year period. To estimate the effects of the reduction, more recent historical data than are contained in the depreciation model were used to determine the amount of unused investment credits available for carryforward at the end of 1985. Separate more refined estimates, including results from the Treasury corporate tax model, were used to determine the pattern of carryover usage, and the extent to which the reduction would restrict credit usage.

Adjustments were also made to the results for the elective 15-year carryback for certain taxpayers, in particular, certain steel companies and qualified farmers. The corporate and individual tax models and an analysis of specific tax returns were used to determine the amount of ITC's affected by the provision, and the extent to which individuals and corporations would be able to utilize the carryback option.

The third adjustment accounts for the tax treatment of equipment used for research and development (R&D) purposes. Under pre-reform law R&D equipment investments were depreciated as three year property. Under tax reform these investments are treated as five year property. Because the depreciation model does not separately identify investment for R&D purposes, it cannot provide estimates that adequately reflect changes in tax depreciation rules that apply to this use of investment. A supplemental model was employed to obtain an estimate of the change in revenue from the altered treatment of R&D.

Table 7.10 **Summary of the Revenue Changes Associated with Capital Cost Recovery Provisions of TRA 86, 1986-1992***

| | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|
| | | | ($ Millions) | | | | |
| Calender Year Tax liability | 13,853 | 18,870 | 27,741 | 36,181 | 45,961 | 58,062 | 59,496 |
| Fiscal Year Receipts | 0 | 23,997 | 23,886 | 30,617 | 41,490 | 52,592 | 58,615 |

*These estimates may differ from other published estimates because they are based on a different economic forecast and include only selected capital cost recovery provisions.

which is added to the results of the depreciation model. A forecast of investment in R&D property is depreciated according to both pre-reform and reform rules. A marginal tax rate is applied to the difference in annual depreciation deductions and the resulting tax change added to the model results for depreciation-related revenue changes. These adjustments add approximately $4 to $5 billion to revenue through 1992.

This adjustment is an approximation because information on the distribution of tax lives of R&D property is not available. Under pre-reform law almost all R&D equipment would be classified as 5 year ACRS property in the depreciation model. Under post-reform tax rules most R&D investment would be classified as 5 year property (computers and high technology instruments) and a smaller portion would be classified as 7 year (or longer lived) property. On average it is assumed that because of the faster depreciation method under reform (200 percent declining balance versus 150 percent) tax depreciation would not be substantially slower (or faster) under reform than before in the absence of special treatment of R&D property. Thus, no net revenue increase would be shown in the depreciation model from the change in tax treatment of R&D property. The supplemental model calculation then approximately adjusts revenue for the change in R&D equipment depreciation rules. If all R&D property under the new rules is 5-year property the adjustment understates the additional revenue from longer tax lives on R&D equipment.

The fourth adjustment is for auto and truck leasing. Although the depreciation model makes some provision for the retirement of assets or sales to nonbusiness sectors, it does not adjust depreciation allowances for recapture of excess depreciation when an asset is sold on the difference between the sale price of assets and the depreciable basis. Recapture increases revenue when depreciation schedules overstate depreciation and reduces revenue when depreciation is understated. In effect, recapture adjusts depreciation allowances to the correct total amount (neglecting inflation) when the asset is sold.

The Tax Reform Act changes the depreciation schedule for autos and light trucks from 3 years, which would generally overstate depreciation, to 5 years. The depreciation method also is changed from approximately 150 percent declining balance to 200 percent declining balance (with an optimal switch to straight line). For automobile and truck leasing, where the holding period is short in many cases and assets are often systematically resold, an adjustment is made to the depreciation model results for recapture. The series for investment in autos and trucks are divided into a leased fraction subject to depreciation recapture. Proportions of auto and truck investments are assumed to be sold each year at a price determined by a depreciation rate, assumed to be 33 percent for autos (Hulten and Wycoff (1981)), and an inflation rate, assumed to be 3 percent over the forecast period. The value of depreciation deductions is calculated twice both assuming no sales and assuming sales distribution patterns for autos and for trucks. The difference between these sale and no sale calculations of $4 billion over the period is subtracted from revenue estimates. The net change from this adjustment is a reduction in the estimated revenue increase in autos and light trucks that would otherwise be calculated for the forecast period from a lengthening of tax depreciation lives.

## APPENDIX

Table 7.11 compares depreciation systems under prior law and the Tax Reform Act of 1986.

Table 7.11 **Comparison of Depreciation Systems**

| Asset (ADR Midpoint Life or Description) | Pre-Reform Law | Tax Reform Act |
|---|---|---|
| 2-4 | 3-yr ACRS | 3-yr DDB/SL |
| R&D equipment (various ADR midpoint lives) | 3-yr ACRS | 5-yr DDB/SL |
| Autos & light trucks (3,4) | 3-yr ACRS | 5-yr DDB/SL |
| Race horses over 2 years old | 3-yr ACRS | 3-yr DDB/SL |
| 13-year and older horses | 3-yr ACRS | 3-yr DDB/SL |
| 4.5-6.5 | 5-yr ACRS | 5-yr DDB/SL |
| Semi-conductor manufacturing equipment (reassigned to 5-year from 6-year ADR midpoint life) | 5-yr ACRS | 5-yr DDB/SL |
| Qualified technological equipment (various and no ADR lives) | 5-yr ACRS | 5-yr DDB/SL |
| Renewable energy property (various and no ADR midpoint lives) | 5,15-yr ACRS | 5-yr DDB/SL |
| 7-9.5 | | |
| Rental clothing (9) | 5-yr ACRS | 5-yr DDB/SL |
| Computer based central office-switching equipment (reassigned to 9.5 from 18-year ADR midpoint life) | 5-yr ACRS | 5-yr DDB/SL |
| 10-12.5 | 5-yr ACRS | 7-yr DDB/SL |
| Breeding and work horses (10) | 5-yr ACRS | 7-yr DDB/SL |
| No ADR life personal property | 5-yr ACRS | 7-yr DDB/SL |
| Railroad track (assigned 10-year ADR midpoint life) | 5-yr ACRS | 7-yr DDB/SL |
| 13-15.5 | 5-yr ACRS | 7-yr DDB/SL |
| Railroad tank cars (14-15) | 10-yr ACRS | 7-yr DDB/SL |
| Single purpose agricultural structures (reassigned to 15-year from 34-year ADR midpoint life) | 5-yr ACRS | 7-yr DDB/SL |
| 16-19.5 | 5-yr ACRS | 10-yr DDB/SL |
| 20-24.5 | 5-yr ACRS | 15-yr 150DB/SL |
| Telephone distribution plant (reassigned 24-year from 35-year ADR midpoint life) | 5,15-yr ACRS | 15-yr 150DB/SL |
| Sewage treatment plant (assigned 24 year ADR midpoint life) | 5-yr ACRS | 15-yr 150DB/SL |
| 25-27 | 5-yr ACRS | 20-yr 150DB/SL |
| 27.5-29.5 | 5-yr ACRS | 20-yr 150DB/SL |

Table 7.11 **Comparison (continued)**

| Asset (ADR Midpoint Life or Description) | Pre-Reform Law | Tax Reform Act |
|---|---|---|
| 27.5-29.5 real property | 19-yr ACRS | 31.5-yr SL |
| 30-35.5 | 5-yr ACRS | 20-yr 150DB/SL |
| 30-35.5 real property | 19-yr ACRS | 31.5-yr SL |
| 36 and over ADR midpoint life | 5-yr ACRS | 20-yr 150DB/SL |
| Sewer pipes (assigned 50-year ADR midpoint life) | 15-yr ACRS | 20-yr 150DB/SL |
| 36 & over ADR midpoint life real property | 19-yr ACRS | 31.5-yr SL |
| Less than 27.5 real property | 19-yr ACRS | 20-yr 150DB/SL |
| Residential housing | 19-yr ACRS | 27.5-yr SL |
| Low-income housing | 15-yr DDB/SL | credit provided |
| Manufactured homes | 10-yr ACRS | 10-yr DDB/SL |
| Public utility property (18.5-24.5) | 10-yr ACRS | by ADR life |
| Public utility property (25+) | 15-yr ACRS | 20-yr 150DB/SL |

## REFERENCES

Fullerton, Don, Robert Gillette, and James Mackie, *Investment Incentives Under the Tax Reform Act of 1986*. Chapter 5 in this volume.

Gorman, John A., Musgrave, John C., Silverstein, Gerald and Comins, Kathy A., *Fixed Private Capital in the United States*, Survey of Current Business. Washington, D.C. (July), pp. 36-47, 1985.

Hulten, Charles R., and Wykoff, Frank C., *The Measurement of Economic Depreciation*, In C.R. Hulten (Ed.), Depreciation, Inflation and The Taxation of Income From Capital, Washington, DC: The Urban Institute Press 1981.

Nester, Howard W., *A Guide to Interpreting the Dynamic Elements of Revenue Estimates*. Chapter 1 in this volume.

Winfrey, Robley, *Statistical Analyses of Industrial Property Determinants* Bulletin 125, Iowa Experiment Station, Iowa State College of Agricultural and Mechanical Arts, Symmetrical No. 3, p. 100, 1935.