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Abstract—This paper measures, for 37 different assets and for 18 different industries, the effective corporate tax rates associated with (a) the existing tax regime in 1980, (b) the introduction of the Accelerated Cost Recovery System (ACRS) in 1981, and (c) the amendments to that system in 1982. We also use a detailed general equilibrium model of the U.S. economy to simulate effects on revenues, investment, long-run growth, and capital allocation among industries. We find significant welfare gains from ACRS, but we find larger welfare gains from alternative plans that were not adopted.

I. Introduction

WITH high inflation and unemployment in 1981, many observers were primarily concerned with the short-run effects of tax cuts on investment, employment, and budget deficits. In contrast, this paper looks at long-run effects of the Accelerated Cost Recovery System (ACRS), as introduced by the Economic Recovery Tax Act of 1981 (ERTA) and as amended by the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA). We estimate the effects of these laws on revenues, investment, growth, and capital allocation among industries.

The approach of this paper combines a Hall-Jorgenson (1967) cost-of-capital formula for the incentive effects of alternative tax rules and a general equilibrium model in the tradition of Harberger (1962) to calculate welfare effects of discriminatory taxes on capital. This model is capable of a second-best evaluation with simultaneous distortions due to corporate taxes, personal taxes, and property taxes. These existing distortions are important for measuring the intersectoral effects of ACRS because nonneutralities of the new tax code may reinforce or offset existing nonneutralities.

We abstract entirely from short-run issues of macroeconomic stabilization. We model real exchanges without a money supply, but we assume that effective tax rates depend upon a constant and correctly anticipated inflation rate. We also assume full employment of productive factors. There is no involuntary unemployment in our model, but individuals make a labor-leisure choice based on the expected after-tax wage. Similarly, there is no underutilization of industrial capital, but individuals make savings-consumption decisions based on the expected after-tax return. We thus capture intertemporal effects of tax policy.

The Tax Act of 1981 changed both depreciation allowances and the investment tax credit. Under ACRS, any depreciable asset falls into one of four classes and is given a tax life of 3, 5, 10, or 15 years. These recovery periods replace the previous system of basing tax lives on expected useful lives. Although these shorter lives were effective immediately, depreciation of new equipment was scheduled to accelerate from 150% to 200% of declining balance during a five year phase-in period. The scheduled increase for depreciation of equipment was never allowed to take place, because TEFRA repealed the transition to double-declining balance. This Act also reduced the depreciation basis by half of the investment tax credit.

These depreciation and investment tax credit provisions have implications for the effective tax on a marginal investment in each type of equipment or structure. In this paper we calculate and compare effective tax rates under the old law and under each new law, along the lines suggested by Jorgenson and Sullivan (1981), Hulten and Wykoff (1981a), and Gravelle (1982). Our paper differs from theirs by including the 1982 law, by

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comparing tax rates under the assumption of tax-minimizing depreciation choices by firms, and, most importantly, by measuring the size of efficiency changes.

Section II describes our concept of an effective marginal tax rate, and these rates are measured in section III for each tax scheme. Section IV presents the major features of the general equilibrium model used to simulate these tax changes, and section V describes our procedure to convert the marginal tax rates into rates appropriate for that model. The results are described in section VI, and section VII is a conclusion.

II. Effective Tax Rates on Marginal Investments

We start with a cost-of-capital formula introduced by Hall and Jorgenson (1967). The profit maximizing firm undertakes a marginal investment project if the present value of its net earnings is at least equal to the initial outlay. Under competitive equilibrium conditions the two will be exactly equal. This condition determines ρ, the required social rate of return (gross of taxes but net of depreciation):

$$\rho = \frac{i(1-u) - \pi + \delta}{1-u}(1 - k - uaz) - \delta \quad (1)$$

where i is the nominal interest rate, u is the statutory corporate tax rate, π is the expected rate of inflation, δ is the exponential rate of economic depreciation, k is the investment tax credit, a is the fraction of the acquisition cost that is eligible for depreciation, and z is the present value of depreciation allowances per dollar of basis. The particular value for z reflects the tax lifetime for the asset, the depreciation schedule, and the discount rate. Because of arbitrage between bonds and real capital, we assume that firms discount at the after-tax interest rate $i(1-u)$. Regardless of the actual source of funds, then, firms must earn this opportunity cost in nominal terms, or $i(1-u) - \pi$ in real terms. Let s denote this real after-tax return to the corporation.

The effective corporate tax rate measures the difference between ρ, the real rate of return gross of tax, and s, the real rate of return net of tax, as a proportion of ρ:

$$e = (\rho - s)/\rho. \quad (2)$$

For investments outside the corporate sector, we rederive equations (1) and (2), using m, the marginal income tax rate of the proprietor, in place of u.

We turn next to the measurement of z, the present value of depreciation allowances per dollar of basis. Because of space limitations, we omit derivations of optimal switching times, the use of the half-year convention, and other details on depreciation schedules. An earlier version of this paper (Fullerton and Henderson, 1983) describes these calculations in more detail, and the book by King and Fullerton (1984, pp. 204–214) discusses these depreciation provisions further.

For the 1981 law, we look only at the post-transition rules that were scheduled to begin in 1986. For equipment, both the old law and the 1981 Tax Act allowed double declining balance (*DDB*), with an optimal switch to sum-of-the-years-digits (*SYD*) after 1-1/2 years.[1] This combination is used here as tax-minimizing practice because it can be shown to provide the earliest possible depreciation deductions.[2] Under the 1981 Tax Act, however, depreciation of the last half year is moved up. The five year asset thus gets *DDB* for 1-1/2 years and *SYD* over only 3 years.

The 1982 law is similar to the 1981 law in that it uses the same ACRS lifetimes, moves up the last half year, and provides tables which specify the time to switch depreciation methods. It allows only 150% of declining balance, however, with a switch to straight-line. Since the 1982 law determines the basis by subtracting half the investment tax credit from the acquisition cost, we set $a = (1 - .5k)$.

For structures, all three laws specify a declining balance rate with a switch to straight-line. The old

[1] Under straight-line, the firm deducts $1/L$ of the purchase price each year for L years. With 150% declining balance, the firm deducts $1.5/L$ of the purchase price in the first year and $1.5/L$ of the remaining basis in later years. With *DDB*, this proportion is $2/L$. Finally, with *SYD*, the firm calculates a *SUM* equal to $\Sigma_{i=1}^{L} i$. It then deducts L/SUM in the first year, $(L-1)/SUM$ in the second year and so on, down to $1/SUM$ of the purchase price in year L. After the firm switches, the new method is applied to the remaining basis for the remaining number of years.

[2] See Shoven and Bulow (1975). Under the old law, the firm could delay its depreciation deductions by delaying the switch or by using straight-line, but the new laws mandate the switchover time for the earliest possible deductions. Our analysis abstracts from these details by using an equilibrium model where all firms expect positive taxable profits (but no abnormal profits) and take depreciation allowances as early as possible.

law allows 150% of declining balance for most structures but *DDB* for residential housing. For both new laws, all structures receive 175% of declining balance.

Finally, we consider effective tax rates on income from investments in land and inventories.[3] Since the firm receives no depreciation allowances for these assets, z is zero. We also assume that the firm minimizes taxes by using only LIFO inventory accounting.

III. Effective Rates Under Each Tax Regime

Equations (1) and (2) express the effective tax rate as a function of u, i, π, δ, k, and z. The corporate tax rate u is taken as 0.46, the top statutory rate on corporations. The expected inflation rate π is taken as 0.07, but we also discuss some results with inflation rates of 4% and 10%. To obtain i, we start by setting s, the real after-tax rate of return. We use 0.04 with the standard parameters and 0.02 or 0.06 for alternative calculations. Then, however s and π are set, i must equal $(s + \pi)/(1 - u)$, by definition.[4]

Other parameters vary across the 37 asset categories listed in column 1 of table 1. Economic depreciation rates δ are taken from Hulten and Wykoff (1981b), as shown in column 2. These rates range from a low of 0.015 for housing to a high of 0.333 for automobiles. Inventories and land are assumed not to depreciate.[5]

The rate of investment tax credit k varies not only by asset but also according to the tax law being simulated. For the 1980 law, in column 3 of table 1, we use the statutory rates of 0.10 for public utility structures and equipment with at least a 7 year tax life, 0.067 for equipment with at least a 5 year life, and 0.033 for equipment with at least a 3 year life. Finally, for the old law, most structures are assigned guideline lifetimes (from Jorgenson-Sullivan, 1981), but the Asset Depreciation Range (ADR) system allows 20% longer or shorter lives for equipment and public utility structures. We assume that firms use the shortest available lifetime, except where the use of a longer life would reduce effective taxes through eligibility for a higher investment tax credit. The resulting vector of lives is shown in column 4.[6]

When the values of z implied by the 1980 law are combined with other parameters described above, we obtain the effective corporate tax rates shown in column 5 of table 1. This column demonstrates considerable variance of effective tax rates by asset. Aircraft, for example, had a 7 year life, accelerated depreciation, and full investment credit, resulting in an effective tax rate of about 2%. Structures were often taxed at rates greater than 46% because of historical cost depreciation with inflation. Inventories and land are effectively taxed at exactly the statutory rate because they received economic depreciation (at rate zero) and no investment credit.

Under ACRS, five-year equipment and public utility structures all get 10% credits while three-year assets receive a 6% credit (column 6). Because of our equilibrium model with no carryover problems, all tax rates reflect statutory credits and do not reflect any increase in availability of the credit through carryover and leasing provisions.

Column 7 displays lifetimes under ACRS, assuming again that each asset is homogeneous. The law assigns a 3 year life to autos, light trucks, R & D equipment, certain racehorses, and personal property with an ADR midpoint of 4 years or less. All other equipment gets a 5 year life. For public utility structures, we assign a 10 year life to

[3] The corporation also earns income on intangible assets such as knowledge acquired through research, or goodwill acquired through advertising. Because we do not have adequate estimates for the stock of these assets in each industry, they are excluded from this study.

[4] Since s is fixed by assumption as we vary π, inflation must add more than point-for-point to the nominal interest rate, as in Darby (1975). Fraumeni and Jorgenson (1980) find a relatively constant real after-tax return in the corporate sector, supporting this modified version of Fisher's Law (MFL). Evidence in Feldstein and Summers (1978) and in Summers (1981) supports a strict version of Fisher's Law (SFL), where inflation adds only point-for-point to nominal interest. Bradford and Fullerton (1981) investigate the implications for effective tax rates of the choice between MFL and SFL, as do we in calculations not reported here.

[5] For assets 27 through 31, the depreciation rates come from Jorgenson and Sullivan (1981). They use the Hulten-Wykoff methodology to obtain estimates for these additional assets. The rate for housing is an unpublished estimate of Hulten and Wykoff.

[6] Lifetimes for many of the 37 assets are actually averaged over more diverse asset categories. As a result, only some of the assets in one of our categories may need their lifetimes adjusted to receive higher credits. Since the aggregation to 37 assets provides considerable detail, however, it seems appropriate to treat each asset as individually homogeneous. One example of where this treatment may be less appropriate is in mining, shafts and wells. The 6.8 year life here reflects an average of intangible drilling with a zero life and other structures with a longer life.

TABLE 1.—PARAMETERS AND EFFECTIVE CORPORATE TAX RATES FOR EACH ASSET

		1980 Law			ACRS		1981 Law	1982 Law
(1) Asset	(2) Hulten-Wykoff Depreciation Rate	(3) ITC Rate	(4) Lifetime	(5) Gross Tax Rate	(6) ITC Rate	(7) Lifetime	(8) Gross Tax Rate	(9) Gross Tax rate
1. Furniture and Fixtures	.110	.100	8.00	.084	.100	5.00	−.228	.076
2. Fabricated Metal Products	.092	.100	10.00	.173	.100	5.00	−.195	.067
3. Engines and Turbines	.079	.100	12.48	.240	.100	5.00	−.172	.061
4. Tractors	.163	.067	5.00	.086	.100	5.00	−.336	.100
5. Agricultural Machinery	.097	.100	8.00	.077	.100	5.00	−.204	.070
6. Construction Machinery	.172	.100	7.92	.107	.100	5.00	−.356	.104
7. Mining and Oil Field Machinery	.165	.100	7.68	.083	.100	5.00	−.340	.101
8. Metalworking Machinery	.123	.100	10.16	.212	.100	5.00	−.252	.082
9. Special Industry Machinery	.103	.100	10.16	.191	.100	5.00	−.215	.072
10. General Industrial Equipment	.123	.100	9.84	.197	.100	5.00	−.252	.082
11. Office and Computing Machinery	.273	.100	8.00	.160	.100	5.00	−.632	.146
12. Service Industry Machinery	.165	.100	8.24	.130	.100	5.00	−.340	.101
13. Electrical Machinery	.118	.100	9.92	.196	.100	5.00	−.243	.079
14. Trucks, Buses, and Trailers	.254	.067	5.00	.120	.100	5.00	−.571	.138
15. Autos	.333	.033	3.00	.198	.060	3.00	−.335	.110
16. Aircraft	.183	.100	7.00	.018	.100	5.00	−.382	.109
17. Ships and Boats	.075	.100	14.40	.281	.100	5.00	−.166	.059
18. Railroad Equipment	.066	.100	12.00	.207	.100	5.00	−.151	.055
19. Instruments	.150	.100	8.48	.139	.100	5.00	−.308	.094
20. Other Equipment	.150	.100	8.16	.116	.100	5.00	−.308	.094
21. Industrial Buildings	.036	.0	28.80	.515	.0	15.00	.419	.419
22. Commercial Buildings	.025	.0	47.60	.515	.0	15.00	.380	.380
23. Religious Buildings	.019	.0	48.00	.491	.0	15.00	.358	.358
24. Educational Buildings	.019	.0	48.00	.491	.0	15.00	.358	.358
25. Hospital Buildings	.023	.0	48.00	.510	.0	15.00	.375	.375
26. Other Nonfarm Buildings	.045	.0	30.90	.550	.0	15.00	.447	.447
27. Railroads	.018	.100	24.00	.266	.100	15.00	.167	.253
28. Telephone and Telegraph	.033	.100	21.60	.294	.100	15.00	.204	.301
29. Electric Light and Power	.030	.100	21.60	.285	.100	15.00	.196	.292
30. Gas	.030	.100	19.20	.260	.100	10.00	.090	.200
31. Other Public Utilities	.045	.100	17.60	.277	.100	10.00	.108	.233
32. Farm	.024	.0	25.00	.456	.0	15.00	.376	.376
33. Mining, Shafts, and Wells	.056	.0	6.80	.354	.0	5.00	.279	.279
34. Other Nonbuilding Facilities	.029	.0	28.20	.488	.0	15.00	.395	.395
35. Residential	.015	.0	40.00	.443	.0	15.00	.343	.343
36. Inventories	.0	.0	∞	.460	.0	∞	.460	.460
37. Land	.0	.0	∞	.460	.0	∞	.460	.460

TABLE 2.—EFFECTIVE CORPORATE TAX RATES FOR EACH INDUSTRY

Industry (1)	1980 Law (2)	1981 Law (3)	1982 Law (4)
(1) Agriculture, Forestry and Fisheries	.443	.433	.440
(2) Mining	.411	.270	.334
(3) Crude Petroleum and Gas	.426	.332	.337
(4) Construction	.403	.361	.397
(5) Food and Tobacco	.435	.369	.395
(6) Textile, Apparel and Leather	.427	.360	.387
(7) Paper and Printing	.407	.304	.349
(8) Petroleum Refining	.458	.386	.403
(9) Chemicals and Rubber	.392	.287	.340
(10) Lumber, Furniture, Stone, Clay and Glass	.422	.337	.375
(11) Metals and Machinery	.431	.366	.393
(12) Transportation Equipment	.450	.406	.420
(13) Motor Vehicles	.403	.307	.359
(14) Transportation, Communication and Utilities	.284	.132	.254
(15) Trade	.447	.417	.429
(16) Finance and Insurance	.484	.408	.412
(17) Real Estate	.447	.377	.377
(18) Services	.385	.208	.296

any asset category with an ADR midpoint between 18 and 25 years, as provided in the law. All other structures have a 15 year life, except mining, shafts, and wells which we reduce from 6.8 to a 5 year life.

The resulting effective tax rates in column 8 of table 1 are consistently negative for all types of equipment and positive for all types of structures. Notice also how sensitive tax rates are to lifetimes or credits. As the lifetime for computers (asset 11) changes from 8 to 5 years, the effective tax rate changes from +16% to −63%. As the credit for autos changes from 0.033 to 0.06, its effective tax rate changes from +20% to −33.5%.

Next, we turn to the 1982 law. Column 9 of table 1 shows effective tax rates for equipment that are positive. In fact, for 6 of the 37 assets (e.g., trucks, aircraft, and electric utility structures), the 1982 law *raised* rates from 1980. For these assets, the tax-increasing effect of the basis adjustment outweighs the tax-reducing effect of shortened tax lives. With 4% inflation, even more types of equipment show tax rates under 1982 law that are higher than under the 1980 law. Real depreciation allowances z are greater at low inflation rates, so the tax-increasing basis adjustment is more important at low inflation rates. Taxation of structures is the same under the 1982 law as under the 1981 law.

Finally, we convert each vector of 37 tax rates by asset into a vector of 18 tax rates by industry, using unpublished data from Dale Jorgenson on the stock of each asset used in each industry. Table 2 shows these effective corporate tax rates. The effective rate on land-intensive industries such as real estate and agriculture reflect the 0.46 tax on that asset, while the low rate on transportation, communications and utilities reflects the tax credits for public utility structures. Because tax rates are reduced from the old law, intertemporal distortions might be reduced. Because they still exhibit considerable variance, however, there is no *a priori* reason that intersectoral distortions will be reduced.[7]

IV. The General Equilibrium Model

In this limited space we can offer only the briefest outline of the model we use. A more detailed description can be found in Fullerton, Shoven, and Whalley (FSW, 1983), and general sensitivity experiments with this model are described in Fullerton, Henderson, and Shoven (1984). The modeled economy is divided into 18 profit maximizing producers, 2 government sectors, 15 consumption commodities, and 12 consumers differentiated by income class. Each industry has a Constant Elasticity of Substitution

[7] We have translated the asset tax rates into industry tax rates through a fixed coefficient capital stock matrix. We therefore measure the costs of interindustry distortions, assuming a zero elasticity of substitution among assets. As an alternative, Gravelle (1982) and Auerbach (1983) measure the costs of inter-asset distortions, assuming a unitary elasticity of substitution among assets.

(CES) value-added function, and each output can be used as an intermediate input through a fixed coefficient input-output matrix. Outputs can be purchased by government, used for investment, or converted into consumer goods. There is also a simple foreign trade sector.

Each consumer has initial endowments of labor and capital services which can be sold for use in production. Because of perfect factor mobility and competition, the net-of-tax return to each factor is equal among industries. A consumer can also choose to buy some of his own labor endowment for leisure. The capital stock is fixed in any one period, but the model allows the savings response to augment the stock in later periods. Demand functions are based on nested CES utility functions, and the elasticity of substitution between present and future consumption is based on an estimate of the uncompensated saving elasticity with respect to the net-of-tax rate of return. For this value we use 0.4 as found by Boskin (1978). 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.

The entire spectrum of federal, state, and local taxes are typically modeled as *ad valorem* tax rates on purchases of appropriate products or factors. The model is solved using a variant of Scarf's (1973) algorithm for an equilibrium price vector where excess demands and profits are zero. Also, the model requires that government run a balanced budget. Therefore, when policy changes generate alterations in tax parameters, the implied revenue gain or loss must be offset by replacement taxes, described below.

The model's industries face different tax rates on their use of capital. Specifically, the total capital tax paid by each industry is the sum of its liabilities under the corporate income tax (CIT), the property tax (PT), the corporate franchise tax (CFT), and the personal income tax on income from capital of that industry. This personal tax component, which we call the "personal factor tax" (PFT), includes personal taxes paid on dividends, retained earnings, and all income from noncorporate business in the industry. To obtain t^{cf}, the "cash flow" tax rate for each industry, capital tax payments are divided by KN, the total net capital income of the industry:

$$t^{cf} = \frac{CIT + PT + CFT + PFT}{KN}. \tag{3}$$

The FSW model obtains these tax rates for the benchmark calculations by using observed corporate income taxes and other taxes paid in 1973 in the numerator of this expression. These *average* effective tax rates are appropriate for simulating income effects and government tax receipts. In a steady state equilibrium model, they are also appropriate estimates of marginal tax rates since the two sets of rates will be equal. Alternative tax regimes are simulated with appropriate adjustments to (3).

With changes in depreciation or investment tax credits, however, only new investments will be subject to the new marginal or "incentive" tax rates t^{in}. Capital income generated by previous investments will continue to be taxed at rates based on old lives and schedules, so cash flow tax rates will gradually approach the new incentive tax rates as a higher proportion of capital is covered by the new law. We have added this capability to the FSW model. Each industry's factor demand functions depend on factor prices gross of incentive tax rates, as these will affect all capital allocation decisions at the margin. On the other hand, cash flow tax rates are used to determine tax receipts and the after-tax incomes of capital owners. In the benchmark sequence of equilibria, t^{cf} equals t^{in} for each industry, but in a tax change simulation the two sets of rates can be specified separately. We thus capture the efficient lump-sum tax effect of providing higher credits and accelerated depreciation for new assets only.

V. The Model-Equivalent Form of Each Tax Regime

For the benchmark calculations, the standard version of the FSW model obtains both t^{cf} and t^{in} from average effective tax rates in (3). Here, by contrast, we calculate marginal effective tax rates for each industry from (1) and (2). However, when we compared different formulations of the marginal tax rates by industry under the old law with different formulations of the average tax rates by industry from Commerce Department data between 1973 and 1978, we never obtained a correlation coefficient higher than 0.3. This lack of resemblance between average and marginal tax rates poses an interesting research question, but one which lies outside the scope of this paper. For now we can appeal to the existence of unanticipated inflation, risk, measurement problems, and transitory profits or losses.[8]

If we accepted the FSW assumption that cash flow tax rates are suitable for use as incentive tax rates in the benchmark, then we would have no new rates appropriate for ACRS. Instead, we assume that marginal tax rates from table 2 are suitable to derive cash flow rates in the benchmark. This procedure satisfies the steady state requirement that average and marginal tax rates be equal in the benchmark, and it provides appropriate new marginal rates for ACRS from table 2.

We thus changed the model by rejecting each industry's CIT data in favor of a counterfactual amount CIT^* that would have been paid under effective tax rates e from the old law. Taking observed after-tax profits (ATP) and interest payments (INT) as fixed data, the counterfactual before-tax return on both debt and equity finance is ($ATP + CIT^* + INT$). This amount corresponds to $\bar{\rho}$, the asset-weighted average of the ρ for each industry, and is taxable at e. Interest payments are deducted by corporations at the statutory rate u (but are then included by individuals later at the individual rate m). Thus $CIT^* = e(ATP + CIT^* + INT) - u(INT)$, and rearrangement provides CIT^* in terms of available data:[9]

$$CIT^* = \frac{e}{1-e}ATP + \frac{e-u}{1-e}INT. \tag{4}$$

Effective rates e from the old law in table 2 are used in (4) to get CIT^* and in (3) to get both t^{cf} and t^{in} for the benchmark. Then, once the benchmark sequence has been calculated, we are ready to specify t^{cf} and t^{in} for simulations. We use e from the new laws in equation (4) to get new CIT^*, and noncorporate effective rates under the new law to adjust personal factor taxes. Equation (3) then provides t^{in} for all future periods.

The cash flow rates, however, begin at the old cash flow rates, since all capital income will initially be generated by assets put in place before the tax change. These older assets depreciate at an average rate $\bar{\delta}$, while the total capital stock increases at approximately the steady state growth rate n. The ratio of old capital to total capital after N years is

$$R = \left(\frac{1-\bar{\delta}}{1+n}\right)^N. \tag{5}$$

The cash flow rate for each period is calculated from (4) and (3) as before, but where e is based on a weighted average of $\bar{\rho}$ from the old law and $\bar{\rho}$ from the new law. The weights after N years are R and $(1 - R)$, respectively.

These procedures furnish model-equivalent tax rates that account for industry differences in the use of many assets, state and local taxes on capital, the degree of incorporation, and the financial decisions of firms. On the other hand, these behaviors are not allowed to change with the tax law. We thus concentrate on capital intensity decisions in this paper.[10]

VI. Simulation Results

The FSW model provides complete descriptions of each equilibrium in the base and revised sequences. For table 3, we extract key results. In part I of this table, simulations are based on an assumed 0.4 saving elasticity; in part II, we assume a zero saving elasticity. In both parts, when the new lower tax rates are imposed, we abstract from expenditure changes or budget deficits by raising some other tax to replace the lost revenue. The revised equilibrium includes either (A) a lump-sum tax on each group in proportion to their original

[8] By considering the expected future tax on a hypothetical dollar of investment, the marginal tax rate depends on expected inflation. Jorgenson and Sullivan (1981) argue that inflation rates have been higher than expected, so historical cost depreciation acts as a lump-sum tax on past investments and increases average effective tax rates. Also, if capital income contains abnormal profits, then cash flow taxes could again exceed the expected future taxes on a competitive marginal investment. Indeed, actual practices do not minimize taxes, as assumed in this paper, and firms can affect taxes by taking charitable deductions. Finally, the marginal tax rate calculations can err by excluding intangible assets, depletion deductions, and other detailed features of the tax code.

[9] In a few cases, where (4) implied negative corporate tax payments, we set CIT^* to zero. An asset can have a negative effective tax rate as in table 1, but only when we assume that the firm has a taxable return on other assets. It would be difficult for a firm, or especially an entire industry, to have negative taxes in the long-run setting of our model.

[10] As mentioned above, Gravelle (1982) and Auerbach (1983) consider changes in the mix of assets. Slemrod (1983) includes debt/equity decisions, explained by clientele effects. Fullerton and Gordon (1983) include debt/equity decisions, explained by bankruptcy costs at the margin. They also include considerations of risk, with a powerful effect on marginal tax rates and welfare costs. Finally, Fullerton-Gordon suggest that local property taxes are not disincentives at the margin to the degree that mobility ensures compensating local public benefits. We abstract from these phenomena here.

TABLE 3.—WELFARE GAINS, REVENUE CHANGES, AND CAPITAL GROWTH FOR EACH TAX REGIME

(1) Tax Regime	(2) Present Value of Welfare Gains in Billions of 1982 Dollars	(3) Eventual Simulation Capital as a Proportion of Base Capital	(4) Eventual Required Replacement Tax as a Proportion of Revenue
I. Standard Parameters:			
$\eta = .4$ ($s = .04$, $\pi = .07$)			
A. Lump-Sum Replacement			
1. 1981 Law	422.2	1.031	.0120
2. 1982 Law	312.3	1.020	.0080
B. VAT Replacement			
1. 1981 Law	361.3	1.032	.0178
2. 1982 Law	272.2	1.020	.0119
3. Pure Income Tax	333.3	0.968	.0068
4. Pure Consumption Tax	3142.1	1.468	.0500
II. Low Saving Elasticity:			
$\eta = 0$ ($s = .04$, $\pi = .07$)			
A. Lump-Sum Replacement			
1. 1981 Law	265.1	1.011	.0159
2. 1982 Law	209.4	1.006	.0105
B. VAT Replacement			
1. 1981 Law	204.6	1.014	.0228
2. 1982 Law	168.1	1.009	.0152
3. Pure Income Tax	265.6	0.958	.0095
4. Pure Consumption Tax	2351.9	1.352	.0662

after-tax incomes, or (B) a consumption-type value-added tax (VAT), equivalent to a sales tax. In either case, the additional tax is at a rate just high enough so that government can make the same real purchases and transfers as in the corresponding period of the benchmark sequence.

The present value of welfare gains, in billions of 1982 dollars, is shown in column 2 of table 3. These are the sums of consumers' equivalent variations, and can be expressed as a percentage of $126 trillion, the present value of consumers' income in the benchmark sequence.[11] That is, the $422.2 billion gain for the 1981 law with lump-sum tax replacement represents 0.34% of base income. The 1982 law results in an estimated welfare gain of $312.3, a lower figure as a consequence of the retrenchment from the tax cuts of 1981.

A substantial portion of the ACRS debate concerned growth and revenue effects of alternative policies. Tax cuts can provide incentives for additional investments which increase total capital and the future tax base. As an indicator of the eventual effects on capital, we show in column 3 the ratio after fifty years of the capital stock in the simulation to the capital stock in the baseline. For the 1981 and 1982 tax laws, the capital stock would be 3.1% and 2.0% higher, respectively, than in the baseline. Then, in column 4, we indicate whether these feedback effects are sufficient to offset the reduction in tax rates. This column shows, after fifty years, the proportion of revenue that must come from the replacement tax, as necessary for government to make the same real purchases. Since ACRS reduces revenue by 1.20% under the 1981 law and by 0.80% under the 1982 law, feedback effects are not sufficient to offset the rate reduction.

Lump-sum taxes are not generally available, so the VAT provides a more realistic replacement tax. The VAT does not distort intertemporal decisions in this model, but it does affect the labor-leisure choice. Welfare gains of ACRS are then roughly 14% smaller, as shown in column 2 of table 3.

The cost-of-capital modifications to the FSW model were motivated by the need to evaluate depreciation and investment tax credit provisions which affect new assets only. For comparison purposes, however, we also use the new model to evaluate a comprehensive income tax and a comprehensive consumption tax. These proposals are

[11] The discount rate is 0.04, the consumers' after-tax rate of return in the model. Because the FSW model uses 1973 data, we multiply all values by 2.53, the ratio of 1982 to 1973 national income.

not necessarily realistic, and they do not require the cost-of-capital modifications, but they represent extreme alternatives against which we can compare the effects of ACRS. We describe them only briefly here, but further specifications as well as simulations using the standard model are available in Fullerton, Shoven, and Whalley (1983).

Under the modeled comprehensive income tax, all real income to labor and capital is subjected only to the individual income tax. The separately operating corporate tax is eliminated, but all real corporate-source income is fully taxed at the personal level. There is no preferential treatment of income saved for retirement or of the imputed net rent from owner-occupied homes. As shown in row 3 of table 3, the overall welfare gains for this pure income tax are roughly similar to those under the Tax Acts of 1981 and 1982. The composition is very different, however. Because ACRS reduced taxes on income from capital, its gains accrue primarily from reduced distortions of intertemporal consumption decisions. The total stock of capital rises, but the varying effective tax rates in tables 1 and 2 indicate that the new laws do not remove distortions in the intersectoral allocation of capital. By contrast, the pure income tax reduces total capital, but it effectively taxes all uses of capital at the same rate. Its gains therefore accrue from reduced intersectoral distortions.

A comprehensive consumption tax in this model operates similarly by including all income in the tax base, but it then allows a deduction for all savings. All intertemporal and intersectoral distortions are removed, as capital is effectively taxed at the same zero rate in all uses. As indicated in row 4, the welfare gains of a consumption tax are roughly ten times those from the two versions of ACRS that have passed. Under such a reform, the capital stock after fifty years would be almost 50% higher than in the baseline. This comparison indicates that, despite the reduction in the taxation of capital under ACRS, there remain unexploited opportunities to encourage investment through fiscal measures.

Part II of table 3 indicates sensitivity to the assumption about the saving elasticity. In the case of zero elasticity of saving with respect to the net of tax rate of return, reductions in the taxation of capital do not encourage as much saving activity. Gains from ACRS are reduced, and because intersectoral effects become relatively more important, are now smaller than those under a pure income tax. The consumption tax remains the reform with the largest efficiency gain.

Additional sensitivity calculations indicate that the 1981 and 1982 tax reforms have larger beneficial impacts when we use a higher rate of inflation or a lower after-tax rate of return.[12] Finally, unreported calculations suggest that the 1984 increase of depreciable lifetimes for structures would have only minor effects on results.

VII. Conclusion

This paper has provided a comprehensive study of the cost recovery provisions in the Tax Acts of 1981 and 1982. Our principal finding is that the Accelerated Cost Recovery System (ACRS) moves the economy toward increased output in the long run by reducing tax rates on income from capital, but it leaves large differences in tax rates among different industries. Nominal capital gains are still taxed, depreciation is based on historical cost over arbitrary lifetimes, and businesses in the corporate sector are taxed differently from those in the noncorporate sector. With these discrepancies, capital will tend to be allocated inefficiently. Results in this paper indicate that the efficiency gains associated with a comprehensive reform such as a consumption tax would be far larger than the gains from ACRS. Such a reform would create a larger revenue shortfall, however. We did not investigate distributional implications of any tax plan, nor did we investigate efficiency or distributional implications of any government expenditure reduction.

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[12] With a 0.4 saving elasticity and the VAT replacement, the welfare gains in billions of 1982 dollars are

	$s = .04$		$\pi = .07$	
	$\pi = .04$	$\pi = .10$	$s = .02$	$s = .06$
1981 Law	271.5	461.7	551.8	301.5
1982 Law	211.3	335.0	399.1	229.5

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