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THE IMPACTS ON CAPITAL ALLOCATION OF SOME ASPECTS OF THE ECONOMIC RECOVERY TAX ACT OF 1981

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ABSTRACT

This paper develops and employs a five-asset, four-household and single-business sector simulation model to measure the long-run impacts of the major provisions of the Economic Recovery Tax Act of 1981 on the allocation of a fixed capital stock among owner-occupied housing, rental housing, and nonresidential capital. The specific provisions analyzed are the increases in tax depreciation for nonresidential capital and rental housing and the reduction in the maximum tax rate on unearned income.

Our analysis suggests a 6 percent increase in nonresidential capital, an 11 percent decline in owner-occupied housing and little change in rental housing (the increase in the number of renters -- the homeownership rate declines by 1½ percentage points -- offsets a decline in the quantity of rental services demanded per renter). In the absence of an increase in aggregate saving, real pretax interest rates rise by nearly two percentage points. Corporate profit taxes decline by 60 percent, and after-tax earnings rise by 25 percent. As a result of the Act, the net (of depreciation) user costs for the three types of capital will almost be equalized.

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THE IMPACTS ON CAPITAL ALLOCATION OF SOME ASPECTS OF THE ECONOMIC RECOVERY TAX ACT OF 1981*

About four years ago, Hendershott and Hu computed net (of depreciation) user costs of capital for several types of nonfinancial capital: producers durables and structures of both corporations and unincorporated businesses, rental housing, and owner-occupied housing.[1] Owing to differences in taxation and financing, the net user costs were lower for housing (especially owner-occupied) than for industrial capital. Moreover, the spread between the user costs on industrial (especially corporate) and residential (especially owner-occupied) capital had risen between the middle 1960s and late 1970s in response to the increase in inflation. The net result was obviously "overinvestment" in owner-occupied housing in the 1970s, although the extent of this was tempered by downpayment and cash-flow constraints and mortgage capital gains.[2] The obvious economic, although not political, solution to this misallocation problem would be to tax owner-occupied housing more heavily (e.g., tax imputed rents), thereby raising its user cost relative to that of industrial capital.

Hendershott and Hu noted that the same effect on relative net user costs could be achieved by taxing industrial capital less heavily; instead of removing tax subsidies to housing, subsidies could be extended to business capital, e.g., the employment of historic cost tax depreciation while using accelerated depreciation schedules and allowing investment tax credits. Businesses would bid for funds to finance capital expansion, driving up real pretax interest rates and lowering the demand for residential capital. In fact, Hendershott and Hu described an array of tax changes that would tend to equate the net user costs for the six capital goods they studied.

The Economic Recovery Tax Act of 1981 appears to be a major step in this direction. The decrease in tax service lives for business capital more than offsets the increase in the effective corporate tax rate (at the current inflation rate) generated by historic cost depreciation and LIFO inventory accounting. In addition, the cut in the maximum tax rate on unearned income (and thus on equity capital gains), the expansion of IRA accounts and the eventual partial exclusion of interest income from taxation significantly raises the attractiveness of investment in assets other than owner-occupied housing.

The present paper develops and employs a simulation model to measure the long-run impacts of the major provisions of the 1981 Tax Act on the allocation of a fixed capital stock among owner-occupied housing, rental housing, and nonresidential capital.[3] We emphasize the word allocation because aggregate savings is implicitly assumed to equal replacement investment in residential and nonresidential capital. Macroeconomic impacts (reduced unemployment of resources) and growth effects (greater labor supply and saving) are not examined. The specific tax changes analyzed are the increases in tax depreciation for nonresidential capital and rental housing and the reduction in the maximum tax rate on unearned income.

The paper is divided into five sections. Sections I and II describe the general form of the simulation model and its initial parameterization, respectively. The equations explaining tenure choice and the demands for housing services from owner-occupied and rental housing services are discussed in more detail in Section III. Section IV contains the simulation results, and Section V summarizes and qualifies the results.

I. The Model

Our description of the model is presented in six brief parts. The first two discuss the determination of nonresidential capital and output and the specification of the demands for housing services. The household categories and their asset demands are described in parts three and four. Government spending and taxes are the topics of part five, and the model is summarized in part six.

Nonresidential Capital and Output

Our economy contains two goods, housing and nonhousing. The nonhousing good is produced by nonresidential corporate capital and labor via a Cobb-Douglas production function

$$(1) \quad Y = K^{\alpha_k} L^{1-\alpha_k},$$

where Y is the level of nonhousing output; L is the labor force; and K is the quantity of nonresidential capital employed which is determined by equating the value of its marginal product to its user cost. Thus,

$$(2) \quad K = \alpha_k Y/c_k ,$$

where c_k is the user cost of nonresidential capital.

Corporations finance their capital by issuing risk-free debt (the interest on which is taxed at the personal level), A^{TX}, and risky equity, A^{EQ}. We assume that average q is unity ($A^{TX} + A^{EQ} = K$) and that the fraction b of corporate capital is debt financed. Finally, the user cost for corporate capital depends on the yields corporations pay on debt Rtx and equity Rk, the expected inflation rate π, the corporate tax rate τ, and any special tax treatment of corporations, denoted by X^k

$$(3) \quad c_k = c_k(Rtx, Rk, \pi, \tau, X^k).$$

The precise form of (3) is presented in Hendershott and Hu (1981a).

The Demands for Housing Services

Housing services are produced with housing capital only, and the services are measured such that one unit of capital produces one unit of services. The demands for these services depend on real after-tax labor income and the real user cost of capital. Assume that households fall into 4 income classes. The demand for housing services by households in the jth class that are homeowners is

$$(4) - (7) \qquad A_j^{OH} = A_j^{OH}(\alpha_{oh} o_j y_j^a, co_j),$$

where y_j^a is the aggregate after-tax real labor income of households in this class, o_j is the fraction of households in the class that are owners, and co_j is the real user cost for this class. The demands for housing services by renters are

(8) - (11) $\quad RH_j = RH_j[\alpha_{rh}(1-o_j)y_j^a,\ cr]$.

The α's are scale factors relating to the share of income allocated to housing consumption.

There are six equations relating real user costs for housing to yields on debt (mortgages) and own equity financing and tax variables. For owners, there are relations for each class, depending on their personal tax rates θ_j,

(12) - (15) $\quad co_j = co_j(Roh_j,\ Rtx,\ \pi,\ \theta_j)$,

where Roh_j is the cost of own equity financing by households in the jth class. For rental housing, there are relations for each of the two household classes that invest in rental housing, even though there is a single user cost or rental rate paid by renters:

(16) - (17) $\quad cr = cr_j(Rrh_j,\ Rtx,\ \pi,\ \theta_j,\ X^h)$,

where X^h reflects the special tax factors related to rental housing.

Finally, there are tenure choice equations for each of the four household classes:

(18) - (21) $\quad o_j = o_j\left(\frac{cr}{co_j}\right)$.

Household Categories

There are four income classes, part of each which owns their own house and part of which rents housing. This gives a total of eight categories.

The incomes and marginal and average tax rates for the four income classes are listed in the top half of Table 1. The after-tax labor incomes can be computed directly from other model variables

$$(22) - (29) \qquad y_j^a = (1-\bar{\theta}_j)(1-\alpha_k)\ell_i Y[o_j Z + (1-o_j)(1-Z)],$$

where Z equals one if the household is an owner and zero if it is a renter. Note that $(1-\alpha_k)\ell_i Y$ is the aggregate before-tax labor income of the ith income class.

The assets held by the various sectors are listed in the lower panel of the table. Note that the fraction of each income class that is an owner-occupied rises monotonically with income from 0.49 to 0.90. Also, only the two highest income classes hold tax-exempt bonds and rental housing. Finally, households finance investment in residential capital (owner-occupied and rental) with debt and own-equity, in fractions ν and $1-\nu$.

Risk Premiums, Asset Demands and Market Clearing

Financial markets adjust such that after-tax, risk-adjusted returns are equilibrated for all investors across all assets. Thus we can write

$$(a) \qquad (1-\theta i_j)Ri_j = (1-\theta_j)Rtx + \rho i_j ,$$

where Rtx is the risk-free rate and ρi_j and θi_j, respectively, are the risk premium and the tax rate applied to the income earned on the ith asset required or held by the jth investor. We assume that each risk premium is the product of the common risk aversion parameter V, the expected after-tax variance of the return, and the proportion of the household's wealth invested in the asset [4]

TABLE 1: INCOME, TAXES AND ASSETS OF HOUSEHOLD CLASSES

Income Range (1977 $ in thousands)	0 - 10	10 - 25	25 - 50	50 +
Income and Taxes				
Before-tax Income (y_j^b)	8	19	37.5	60
Fraction of Households in class (h_j)	0.39	0.44	0.10	0.07
Fraction of Labor Endowment in class (ℓ_j)[a]	0.15	0.41	0.18	0.26
Marginal tax rate (θ_j)	0.15	0.22	0.35	0.50
Average tax rate ($\bar{\theta}_j$)	0.015	0.099	0.166	0.248
After-tax Income (y_j^a)	7.88	17.12	31.29	45.14
Assets				
Taxable Debt (bonds and mortgages)	√	√	√	√
Equities	√	√	√	√
Tax-Exempt Bonds			√	√
Rental Housing			√	√
Owner-Occupied Housing (o_i)	0.49	0.70	0.86	0.90

a) $\ell_j = h_j y_j^b / \sum_j h_j y_j^b$

Sources: U.S. Annual Housing Survey and Standard Federal Tax Reporter.

$$(b) \qquad \rho i_j = V(1-\theta i_j)^2 \sigma i_j^2 \frac{A_j^i}{W_j} .$$

Substituting (a) into (b) and solving for the portfolio shares, we write twenty general demand equations for equities (8), tax-exempts (4), rental housing (4), and owner-occupied housing (4) as

$$(30) - (49) \qquad \frac{A_j^i}{W_j} = \frac{(1-\theta i_j)Ri_j - (1-\theta_j)Rtx}{V(1-\theta i_j)^2 \sigma i_j^2} .$$

Following Hendershott and Hu (1981a), the after-tax equity returns to shareholders are given by

$$(50) - (53) \qquad Rk_j^a = \{1 - [\gamma + (1-\gamma)\mu]\theta_j\}Rk + \gamma(1-\mu)\theta_j \pi ,$$

where γ is the portion of real earnings paid out and μ is the ratio of the concurrent effective capital gains tax rate to the income tax rate.

The eight demands for taxable debt are derived residually from the balance sheet constraints:

$$(54) - (61) \qquad \sum A_j^i = W_j + v(A_j^{OH} + A_j^{RH}),$$

where v, again, is the loan-to-value ratio on residential housing. Finally, there are market-clearing equations for the markets for taxable debt (bonds and mortgages), equities, tax-exempt securities, and rental housing (there is no equation for owner-occupied housing because supply and demand are necessarily equal at all times):

$$(62) \qquad \sum A_j^{TX} = bK + v\sum (A_j^{OH} + A_j^{RH}) + \overline{FED}$$

$$(63) \qquad \sum A_j^{EQ} = (1-b)K$$

$$(64) \qquad \sum A_j^{EX} = \overline{EX}$$

$$(65) \qquad \sum A_j^{RH} = \sum RH_j .$$

The volumes of outstanding state and local tax-exempt debt ($\overline{EX}$) and federal debt ($\overline{FED}$) are treated as exogenous, and both are assumed to have financed government investment.

Taxes and the Government

Nine equations are introduced to compute taxes by household class and to add up total household taxes. For each class,

$$(66)\text{ - }(73)\qquad TXH_i = \mu\bar{\theta}_i(cgA_i^{EQ} + \pi A_i^{RH}) + \tau_h^p(A_i^{OH} + A_i^{RH}) +$$

$$\bar{\theta}_i[y_i^b + RtxA^{TX} + divA^{EQ} + rA^{RH} - (Rtx + \tau_h^p)v(A_i^{OH} + A_i^{RH})]$$

where $div = \gamma\frac{EAT + b\pi K}{(1-b)K}$, $cg = \frac{RE + \pi K}{(1-b)K}$, and $r = cr - vRtx - \tau_h^p$ - tax depr. The three terms reflect capital gains taxes (μ is the ratio -- assumed to be 0.133 -- of the average concurrent effective capital gains tax rate to $\bar{\theta}$), property taxes (τ_h^p is the property tax rate -- 0.018), and Federal income taxes. Regarding div and cg, EAT is corporate earnings after taxes, RE is corporate retained earnings, and γ(=0.4) is the proportion of real earnings paid out. An exception arises for the highest income category. For these groups (both owners and renters), the average tax rate was applied to labor income only. For renters, $\bar{\theta}$ was otherwise replaced by an average of 0.6 and θ (0.5); for owners, 0.55 and θ were averaged. That is, unearned income is assumed to be taxed at a higher rate than labor income and the rate is higher for renters, who do not have expenses on owner-occupied housing to itemize, than for owners.

Total household taxes are computed by aggregating across households:

$$(74)\qquad TXH = \Sigma\, TXH_i\ .$$

Corporate taxes and income are also computed endogenously. For taxes, we have

$$(75) \qquad TXK = \tau\{\alpha_k Y(.6) - [\delta_{tx}(.65) + bRtx + \tau_k^p]K(.6)\}$$

$$+ \tau_k^p K(.6) - .004K(.6),$$

where τ is the statuatory corporate tax rate (0.52 which reflects state, as well as Federal, taxes), δ_{tx} is effective rate of tax depreciation,[5] and τ_k^p is the corporate property tax rate (0.012). The last term is a crude attempt at incorporating the investment tax credit. The 0.6 factor is the ratio of gross corporate product to total GNP net of housing services (Y); the 0.65 factor is the ratio of plant and equipment to total capital (including land and inventories). The last two model equations explain after-tax earnings and retentions:

$$(76) \qquad EAT = \alpha_k Y(.6) - [\delta_{tx}(.65) + bRtx]K(.6) - TXK$$

$$(77) \qquad RE = (1-\gamma)EAT - \gamma b\pi K(.6).$$

Government spending is assumed to equal taxes paid by households and businesses. A "true" tax cut -- one that does more than offset bracket creap due to inflation -- then, is assumed to be "financed" by budget cuts elsewhere. This seems realistic in the current (1981-82)

setting. It is, of course, possible to simulate simultaneous increases in some taxes and decreases in others.

Model Summary

The model equations are summarized by market in Table 2. In addition to the five asset markets, a "market" for nonresidential capital and output is listed. The equations for each market are divided into demand, supply, and "returns". The latter includes: market-clearing equations, user-cost expressions, and relations for household specific after-tax returns on residential capital and corporate equity. To clarify matters, symbols for the return variables are listed. In addition to the 53 market equations, 12 expressions for tenure choice and after-tax labor incomes and 12 "tax" equations were specified above.

II. Parameterization of the Model

The exogenous variables in the model are the following:

a) risk parameters: V and σ^2's for the four risky assets

b) inflation and debt ratios: π, b and v

c) wealth and labor income distribution endowments: the w_i and ℓ_i

d) production parameters: α_k, α_{oh}, and α_{rh}

e) tax parameters: τ, X^k, X^h, θ_j and $\bar{\theta}_j$

f) other: W, L, TEX and FED.

Because the last year of available income tax data is 1977, the model has been parameterized for this year. The ℓ_i, θ_i and $\bar{\theta}_i$ are computed from this data (see Table 1). The other tax parameters are described in Hendershott and Hu (1981a) and Hendershott and Shilling (1981). We set

TABLE 2: THE MODEL EQUATIONS BY MARKET

	Demand	Supply	Returns	Total
Taxable Debt	8		Rtx	9
Equities	8		Rk, Rk^a_j	13
Tax Exempt Bonds	4		Rex	5
Rental Housing[a)]	4	4	Rrh_3, Rrh_4, cr	11
Owner-Occupied Housing	4		co_j, Roh_j	12
Business Capital and Output	1	1	c_k	3
Total	29	5	19	53

a) The 3 and 4 subscripts on Rrh denote the two highest (3 and 4) income classes.

π = 0.06, W = \$5715 billion, TEX = \$224 billion, FED = \$350 billion, V = 3, b = 0.333, and v = 0.8. W, TEX, and FED are 1977 values from Federal Reserve flow of funds data; π is our best guess on 1977 expected inflation; V is a common risk aversion parameter of no real import because $V\sigma i^2$ is what matters so a set of σi^2's can be selected to be consistent with any value of V; and b and v are the fractions of marginal investments in nonresidential and residential capital that appear to be debt financed.

The remaining variables -- the four σi's, four w's, three α's, and L -- are set such that an array of endogenous variables would be initialized at their observed 1977 values. This array includes, Y, K, ΣA^{RH}, ΣA^{OH}, TXK, Rtx, Rex, cr, and the four coh's. The 1977 values of these variables were: Y = \$1784 billion, K = \$3006 billion, ΣA^{RH} = \$523 billion, ΣA^{OH} = \$1613 billion, TXK = \$80.7 billion, Rtx = 0.08, Rex = 0.0560, cr = .091, co_1 = .0933, co_2 = .0568, co_3 = .0283, and co_4 = .0189.[6] The latter five variables are not observed but were constructed and utilized in the estimation of demands for housing services (see the following section). In effect, the simulation model was coded with these quantities, yields, and user costs as exogenous and solved for the σi^2's, the w's, the α's and L. The solutions were

$\sigma^2_{oh} = 0.0384$, $\sigma^2_{ex} = 0.0448$, $\sigma^2_{equ} = 0.0635$ and $\sigma^2_{rn} = 0.0824$

$w_1 = 0.126$, $w_2 = 0.437$, $w_3 = 0.217$ and $w_4 = 0.220$

$\alpha_k = 0.29$, $\alpha_{rh} = 0.0829$, $\alpha_{oh} = 0.0586$ and L = 1442 billion.

When the w_i are compared with the h_i, we find that the \$10-25 thousand income class has about its share of wealth, the \$25-50 class has twice as much wealth per household, and the over \$50 class has three times as much wealth per household. When the w_i are compared with the ℓ_i, the highest and lowest income groups are seen to have relatively low wealth/labor-income ratios.

The simulations that produced the above variables also generated full balance sheets for the eight household sectors. The dollar values of these balance sheets and the ratios of assets to net worth (where mortgage debt is treated as a negative asset) are listed in Tables 3 and 4. Note that the share of wealth in risk-free debt (either gross or net of mortgage debt) declines as income rises, while the shares in everything else rise with income.

The computed values of EAT and RE are, in billions of dollars, 64.5 and 24.3. The observed 1977 values for EAT and RE were 67.1 and 25.5, quite close to those simulated. (These values are corrected for the Commerce Department's inventory valuation and capital consumption adjustments.)

The initial values for the household specific after-tax rates of return are listed in Table 5. The pre (household) tax return to corporate equity is Rk = 0.1111.

TABLE 3: INITIAL BALANCE SHEETS OF HOUSEHOLD SECTORS

Income Range	Tenure Mode	Owner-Occupied Housing	Rental Housing	Tax Exempts	Equities	Debt	MOR^S	Wealth
0-10	OWN	116	0	0	82	246	93	351
	RENT	0	0	0	86	282	0	369
10-25	OWN	560	0	0	479	1167	448	1758
	RENT	0	0	0	202	540	0	742
25-50	OWN	378	236	32	386	527	491	1068
	RENT	0	38	5	62	97	30	172
> 50	OWN	558	225	169	627	179	626	1132
	RENT	0	24	18	79	22	19	124
		1613	523	224	2003	3060	1707	5716

TABLE 4: HOUSEHOLD ASSETS AS SHARE OF WEALTH

Income Range	0 - 10		10 - 25		25 - 50		Greater than 50	
	Own	Rent	Own	Rent	Own	Rent	Own	Rent
DEBT	.701	.767	.664	.728	.493	.564	.158	.177
EQUITIES	.233	.233	.272	.272	.361	.361	.554	.637
TAX EXEMPTS	0	0	0	0	.030	.030	.149	.145
RENTAL HOUSING	0	0	0	0	.221	.221	.199	.194
OWN HOUSING	.331	0	.319	0	.354	0	.493	0
-MOR	-.265	0	-.255	0	-.460	-.176	-.553	-.153
TOTAL	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

TABLE 5: HOUSEHOLD SPECIFIC AFTER-TAX RETURNS

Income Range (1977 $ in thousands)	0-10	10-25	25-50	50+
Equities (Rk^a)	.1063	.1040	.0997	.0932
Owner-Occupied Housing (Roh)	.1062	.0991	.0928	.0928
Rental Housing (Rrh)	---	---	.09	.10

III. The Demands for Housing Services

The specification of the demand for housing services and the rental-ownership tenure choice deals simultaneously with the discrete and continuous aspects of housing decisions. Following King (1981), we posit a translog indirect utility function for the ith household in the jth class as

$$\log v_{ji} = \beta_1[\log(\frac{y_j^a}{P^c}) - \beta_2 \log(\frac{P_j^h}{P^c}) - \beta_3\{\log(\frac{P_j^h}{P^c})\}^2] + \epsilon_{ji} ,$$

where P_j^h and y_j^a, respectively, are the price of housing services and nominal after-tax labor income for a household in the jth class, P^c is the price of the composite commodity, the β_1 are positive constants, and ϵ_{ji} reflects the effects of the idiosyncracies in tastes of the household. Except for these idiosyncracies, the households within our four income classes are identical.

The individual household is assumed to make the tenure choice that maximizes its utility. Assuming the stochastic utility components, the ϵ_j, are independently and identically distributed with a double-exponential distribution, the logarithm of the odds of households in the jth class choosing to own rather than rent is

$$\log(\frac{o_j}{1-o_j}) = -\beta_1\beta_2 \log(\frac{co_j}{cr}) - \beta_1\beta_2[(\log co_j)^2 - (\log cr)^2] ,$$

where co_j and cr equal P_j^h/P^c, depending on whether the household owns or rents. (These c's are generally referred to as real user costs.) This expression is known as the logit probability model [for more details see Domencich and McFadden (1975)].

The data on the probability of homeownership are taken from the Annual Housing Survey for the years 1973 to 1979. This study analyzes the tenure choice decision for households over time by real income groups. The definitions and breakdown of the classes are 0-3,000, 3,000-4,000, 4,000-5,000,

5,000-6,000, 6,000-7,000, 7,000-10,000, 10,000-15,000, 15,000-25,000 and over 25,000. The probability, o_j, that a household in income class j will choose to own is approximated by the ratio of the number of homeowners to the number of households in that income class.

The real price of owner-occupied housing services is defined as

$$co_j = cu_j^{(1+\alpha m_j)} ,$$

where cu_j is the unconstrained real user cost, m_j is a mortgage-property tax payment constraint variable, and α is a parameter to be estimated. The mortgage-property tax payment constraint variable, m_j, attempts to capture the extent to which financing costs and property taxes impinge upon the buyer's liquidity. The value of m_j is based on net-of-tax mortgage and property tax payments on a dollar of housing, assuming 75 percent debt financing at the mortgage rate for the relevant year, times the ratio of a 1974 constant-quality house to mean household disposable real income. The value of α is determined in the estimation.

The construction of the unconstrained user costs of owning by income class follows Hendershott and Hu (1981c). The data employed in the calculation of cu_j are identical to that used in Hendershott and Hu with the exception that the required after-tax return on equity for taxpayers with low to medium marginal tax rates is the after-tax mortgage rate plus a three percentage point risk premium and for taxpayers in higher tax brackets the required after-tax return on equity is taken to be the tax-exempt rate plus the risk premium.[7]

The calculation of the user cost of capital of rental housing utilized in the analysis is an extension of that described in Hendershott and Shilling (1981). The extension consists of viewing the optimal behavior of an investor in rental housing as: 1) investing in rental housing until the marginal product of capital equals the user cost, and 2) choosing an optimal holding period in order to maximize wealth. The basis for determining the real user cost of capital of rental housing then depends on maximizing the present value of all future expected cash flows generated over the optimal holding period of the property or equivalently minimizing the user cost of capital with respect to the optimal holding period.

The best estimate of the logit probability model using a pooled equation regressions technique is

$$\log\left(\frac{o_j}{1-o_j}\right) = \underset{(-5.10)}{-3.846} \log\left(\frac{co_j}{cr}\right) - \underset{(3.09)}{.383} \left[(\log co_j)^2 - (\log cr)^2\right],$$

$$\rho = .808,\ R^2 = .859,\ \bar{R}^2 = .856,\ \text{SEE} = .294$$

where t-statistics are shown in parentheses. Both coefficients have the expected sign and are significantly greater than zero at the 95 percent confidence level. The effect of the impact of credit market constraints (nominal interest rates) and property tax payments on the prices of owner-occupied housing services diminished as income increased and was assumed not to bind households in the highest income groups. In the model simulations, α is set equal to zero.

The demand for housing services can be derived by applying Roy's identity to the indirect utility function. The demand for housing services by households in the jth class that are homeowners is

$$A_j^{OH} = \frac{y_j^a}{\beta_1 P^c co_j} [\beta_1\beta_2 + 2\beta_1\beta_3 \log co_j],$$

where $\beta_1\beta_2 = 3.846$ and $\beta_1\beta_3 = 0.383$. Similarly, the demand for housing services by renters is

$$RH_j = \frac{y_j^a}{\beta_1 P^c cr} [\beta_1\beta_2 + 2\beta_1\beta_3 \log cr].$$

The scale parameter β_1 is determined in the initial parameterization such that the sum of household demands for housing services equals the existing housing stock. Different scale parameters are allowed for the owner and rental markets. More specifically, $1/\beta_1$ equals α_{oh} in the A_j^{OH} equations and α_{rh} in the RH_j equations.

The implied price elasticities of the demand for owner-occupied and rental housing services are listed in Table 6 for 1976. Also listed is the weighted average of the price elasticities for owner-occupied housing. These results can be compared with Polinsky and Elwood (1979), who report an elasticity of -0.7, and Hanushek and Quigley (1980), who estimate an elasticity of -0.4.

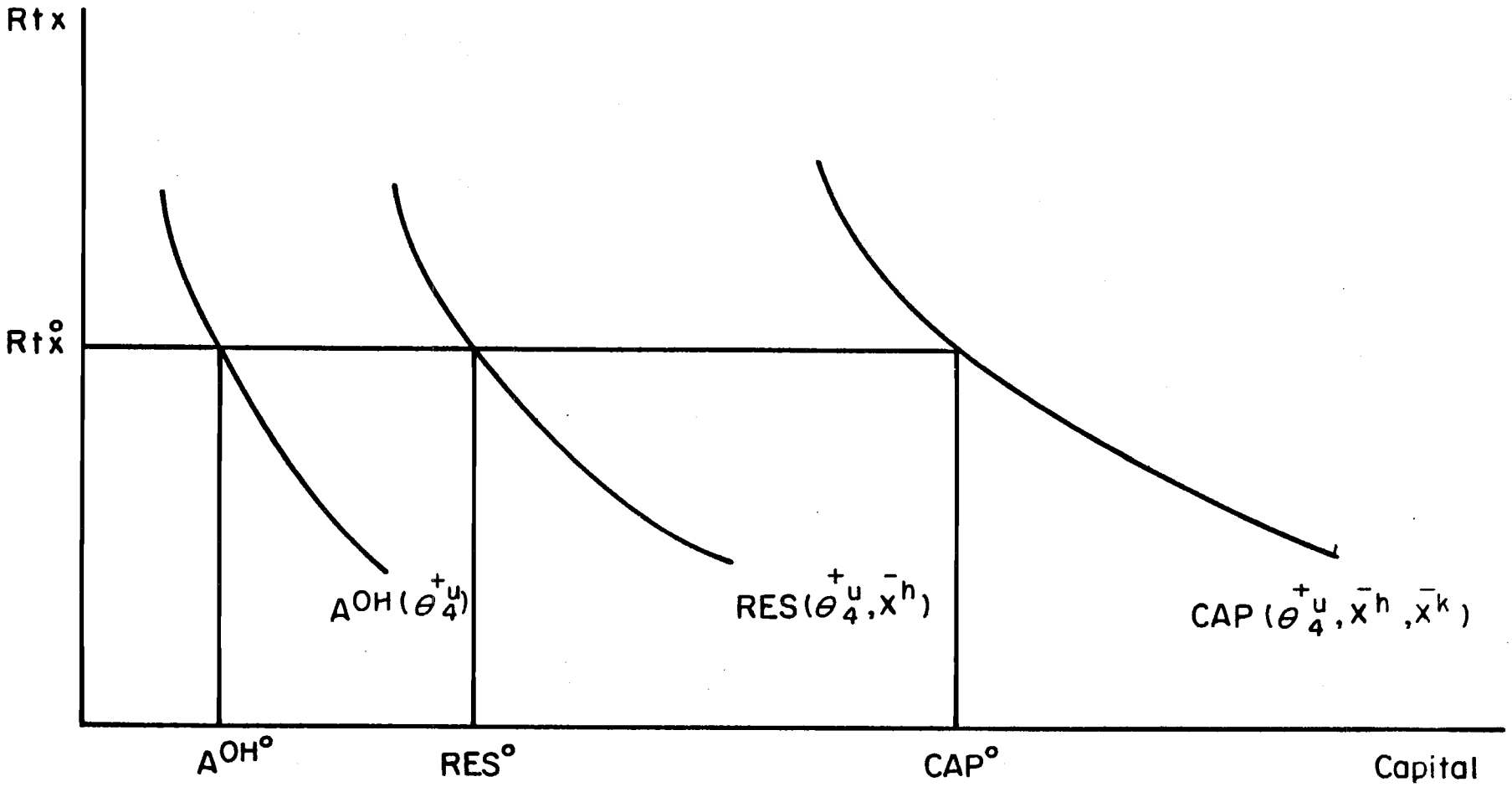
IV. Some Impacts of The 1981 Tax Act

The long-run impacts of the various tax changes considered on the allocation of a fixed aggregate capital stock can be illustrated in Figure 1. The risk-free taxable debt rate is on the vertical axis and the quantity of capital is on the horizontal. The first schedule is the aggregate demand for owner-occupied housing. While this schedule is drawn for given values of a large set of exogenous variables, the only one listed is the marginal tax rate on "unearned" income of the highest income class, θ_4^u. (An increase in θ_4^u, ceteris paribus, will lower the user cost for owner-

TABLE 6: PRICE ELASTICITIES OF DEMAND FOR HOUSING SERVICES IN 1976

Income Group	Owner-Occupied Housing
< 3,000	-.61
3,000-3,999	-.61
4,000-4,999	-.61
5,000-5,999	-.57
6,000-6,999	-.56
7,000-9,999	-.55
10,000-14,999	-.54
15,000-25,000	-.46
> 25,000	-.30
Weighted Average	-.53
Rental Housing	-.62

FIGURE 1: THE TAXABLE DEBT RATE AND THE ALLOCATION OF CAPITAL



$RES = A^{OH} + A^{RH}$

$CAP = RES + K$

occupied housing of the highest income households.) This demand schedule (all capital demand schedules) is negatively related to the taxable debt rate because an increase in this rate, ceteris paribus, will raise the real user cost for housing for all income classes.

The second schedule is the sum of the aggregate demands for owner-occupied and rental housing. This schedule is drawn for a given level of taxation of rental housing, X^h, as well as a given value of θ_4^u. An increase in X^h raises the user cost for rental housing and thus shifts the RES($=A^{OH}+A^{RH}$) schedule to the left. The total capital schedule is drawn for given levels of θ_4^u, X^h, and X^k, the level of taxation of nonresidential capital. An increase in X^h shifts RES and CAP(=RES+K) equally to the left, the latter because of the former. An increase in X^k shifts only CAP to the left.

Now consider the recently passed reduction in the tax service lives of business capital. Both X^k and X^h are reduced, although the latter by less than the former.[8] As a result, RES shifts slightly to the right, and CAP shifts strongly to the right. The increased financing needs raise the yield on taxable debt (and yields on other assets through portfolio substitution effects). This will lower the demand for owner-occupied housing per owning unit and will likely reduce the number of owners (see below). The demand for nonresidential capital will certainly rise. The impact on rental housing is ambiguous. Given the small reduction in the taxation of rental housing relative to the significant rise in interest rates, the user cost of rental housing will likely rise, lowering the demand per renting unit. On the other hand, the user cost of rental housing will likely fall relative to that of owner-occupied housing, causing a shift in tenure toward rental housing.

We wish to emphasize the strong assumption employed here that total saving is unaffected by the cut in tax depreciation. Not only do households not increase their saving in response to the increase in real rates of return, but they fully offset the increase in business saving (retained earnings). That is, households fully "pierce the corporate veil."[9] We would anticipate a significant increase in total private saving and thus a dampening of the tendency for interest rates to increase. Ignoring the saving response allows us to concentrate on the allocative effects of the tax changes.

The impact of a reduction in the taxation of rental housing only seems clear. While this reduction, too, will raise interest rates, the user cost of rental housing will fall, while those of owner-occupied housing and nonresidential capital will rise. There will be less owner-occupied housing, owing to both lower demand per unit and fewer owning units, and less nonresidential capital.

Because a reduction in θ_4^u lowers the demands for owner-occupied housing, rental housing and nonresidential capital -- all schedules shift to the left with the shift being greater for RES than for A^{OH} and for CAP than for RES. Interest rates will decline sufficiently to maintain total demand for capital equal to the given stock. Unfortunately, the directional impacts on the specific capital components cannot be ascertained from Figure 1. This would, of course, lead one to suspect that these impacts are not large.

Our presentation of the simulation results of the Tax Act is divided into four parts in order to illustrate both the impacts of the different tax changes and the workings of the model. The first three parts deduce

the separate impacts of the increase in tax depreciation of nonresidential capital, the reduction in maximum tax rate on unearned income, and the increase in tax depreciation of rental housing. The fourth part computes the combined impact of these three changes.

Increase in Tax Depreciation of Nonresidential Capital

The simulation results reported in Tables 6 and 7 reflect the impact of a shortening of tax service lives of corporate capital (an increase in tax depreciation). More specifically, we lowered the real user cost of corporate capital exogenously so as to reflect passage of Jones-Conable or the 10-5-3 depreciation tax lives. In earlier work, Sheng Hu and I calculated that this legislation would lower the real user cost, ceteris paribus, by 4 percentage points (Hendershott and Hu, 1981b, p. 99). While a 15-5-3 depreciation schedule is less valuable to businesses than 10-5-3, the Economic Recovery Tax Act has some tax reduction features in addition to the cut in the tax services lives. For example, the investment tax credit for equipment was broadened, the credit being roughly doubled for equipment with a useful life under 7 years. The credit was also expanded to cover facilities used for storage of petroleum and its primary products, and the carryback period was extended to 15 years. In any event, we have simply lowered the tax depreciation component of the real user cost by 4 percentage points. Finally, it should be noted that this analysis, like any employing the Jorgensonian user cost framework, assumes full lease-back provisions, i.e., the tax cuts apply to all potential investments, independent of whether the particular companies are or are not currently earning profits.

TABLE 7: THE IMPACT REAL EFFECTS OF AN INCREASE IN TAX DEPRECIATION FOR NONRESIDENTIAL CAPITAL

	Real User Cost[a]			Quantity		
	Initial	Δ	%Δ	Initial	Δ	%Δ
Capital:						
Nonresidential	17.21	-.69	-4	3005.8	178.2	6
Owner-Occupied Housing	3.96	1.29	33	1613.0	-147.0	-9
Rental Housing	9.10	1.62	18	523.1	-31.2	-6
Output, Taxes and Earnings:						
Output				1784.7	30.1	2
Business Taxes				80.7	-33.9	-42
Earnings After Taxes				64.5	15.9	25
Retained Earnings				24.2	8.7	36
Household Taxes				231.2	1.8	1

[a]User costs are measured in percentage points; that for owner-occupied housing is a weighted average of those for the four household classes, the weights being their fraction of the initial stock held. Dollar magnitudes are in billions of 1977 dollars.

TABLE 8: THE PORTFOLIO EFFECTS OF AN INCREASE IN TAX DEPRECIATION FOR NONRESIDENTIAL CAPITAL

	Income Class			
	0-10	10-25	25-50	> 50
After-Tax Yield Spreads[a]				
Equities	.06	.14	.29	.52
Owner-Occupied Housing	-.21	-.39	-.44	-.26
Rental Housing			-.54	.19
Tax-Exempts			-.21	.21
Percentage Changes in Holdings				
Equities	2	3	6	8
Owner-Occupied Housing	-8	-12	-12	-4
Rental Housing			-14	3
Tax-Exempts			-53	10
Debt	0	-1	1	-40

[a]Measured in percentage points. The spreads are the after-tax yields on the listed asset less $(1-\theta_i)Rtx$, the after-tax yield on debt instruments.

The upper half of Table 6 indicates the impact on the real user costs and quantities of the three types of capital. The taxable debt yield rises by 2.11 percentage points in order to restrain the total demand for capital to the existing stock. As a result, the real user cost for nonresidential capital declines by only a third of a percentage point, and those for housing rise by 1.3 to 1.6 percentage points. Nonresidential capital increases by 6 percent, owner-occupied housing decreases by 9 percent, and rental housing is lowered by 6 percent.[3]

Not surprisingly, this tax change has a major impact on corporate taxes and earnings (see the lower half of Table 6). Total corporate taxes decline by 42 percent. Because property taxes rise slightly (from $21.6 billion to $22.9 billion), profit taxes are estimated to drop by a full 60 percent. Earnings after taxes rise by 25 percent and retained earnings, by 36 percent. The impact on household taxes is negligible.

Next we turn to the portfolio effects of the increase in tax depreciation. The initial effect of the increase is a decline in the real user cost for nonresidential capital and an increase in the return on corporate equity. Because households shift from debt instruments to equities and corporations issue debt (and equity) to finance their greater investment, the yield on taxable debt rises. This renders tax exempts and both owner-occupied

and rental housing less attractive, the latter because they are heavily debt financed. Changes in the after-tax yield spreads required to establish the new equilibrium are presented in the top half of Table 8. These are changes in the after-tax yields on the listed asset less that on debt instruments, and the net changes vary by income class (the investor's tax bracket). As can be seen, equities are more, and owner-occupied housing less, attractive for all income classes. Rental housing and tax-exempts are also less attractive for those in the $25-50 thousand income group, but more attractive for those with higher incomes. Of course, tax exempts cannot become less attractive for all investors because the exogenous stock must be held by someone.

The percentage changes in asset holdings are listed in the lower half of the table. These changes correlate closely with the changes in after-tax yield spreads. The higher the income class, the greater the shift into equities. Also, the two middle income groups, which experience the greater declines in the relative return on owner-occupied housing, reduce their holdings by greater amounts. These groups reduce their homeownership rates by just over a percentage point; the other two groups have negligible changes in ownership.

The $25-50 thousand group also shifts out of exempts and rental housing, the latter shift being over 50 percent. While the ratio of the exempt to taxable debt yields declines from 0.70 to 0.67, the spread between the exempt and after-tax taxable debt yield rises for those in the highest tax group. The net yield on rental housing also rises for this group. The <u>dollar</u> movement into equities and out of housing and exempts is about a wash for the three lower income groups, so changes in their debt holdings

are minor. The highest income group, which shifts into rental housing and exempts as well as into equities, liquidates 40 percent of its debt holdings.

Reduction in the Maximum Tax Rate on Unearned Income

The Tax Act lowers the maximum tax rate on unearned income from 70 to 50 percent. We assume that this translates into a reduction in the average marginal tax rate for owners in the highest income class from 55 to 50 percent. For the tenth for the higher income class that rents, the reduction is from 60 to 50 percent. The average tax rates on capital income fall from 52.5 to 50 and 55 to 50, respectively.

The initial impact of this tax cut is on the highest income group only; taxable debt instruments become more attractive and all other assets relatively less attractive, housing investments owing to the reduced tax saving on interest deductions. As a result, the taxable debt yield declines. This induces all other household groups to shift out of debt instruments and into the other assets. The necessary change in the debt yield required to achieve the new equilibrium is small, however (a decline of 21 basis points), and thus the impact on capital allocation is minor. Owner-occupied housing increases by $1.5 billion, and rental housing and nonresidential capital decrease by $0.3 and $1.2 billion, respectively.

Nonetheless, some quite significant portfolio shifts occur. Table 9 presents the dollar value changes in asset holdings; mortgage debt (which equals 80 percent of housing) is treated as a negative asset in order that the asset changes sum to zero. To put these changes in perspective, the percentage changes in holdings of equities are, from the lowest to the highest income groups: 6, 5, 4 and -9. For holdings of taxable debt,

TABLE 9: THE IMPACT OF A REDUCTION IN THE MAXIMUM TAX RATE ON UNEARNED INCOME[a]

	Income Class				
	0-10	10-25	25-50	> 50	Total
Balance Sheets					
Equities	10.1	35.2	17.2	-63.3	-0.8
Tax-Exempts	-	-	20.1	-20.1	-
Owner-Occupied Housing	2.7	12.7	6.5	-20.4	1.5
Rental Housing	-	-	26.7	-27.0	-0.3
Taxable Debt	-10.6	-37.7	-44.0	92.9	0.6
-Mortgages	-2.2	-10.2	-26.5	37.9	-1.0
	0	0	0	0	0
Ownership Rate	1.6	0.6	0.4	-1.5	0.5
Taxes	0.0	-0.3	0.1	2.0	1.8
Memo: Level of Wealth	720	2500	1240	1256	5716

[a]Ownership rates are in percentage points; dollar magnitudes are in billions of 1977 dollars.

the changes are: -2, -2, -7, and 46. The net indebtedness of the highest income group (mortgage debt less holdings of taxable debt) falls by 31 percent. There are also significant shifts in holdings of tax-exempts and rental housing from the highest income group to the $25-50 thousand group. (The ratio of the exempt rate to the taxable debt rate rises from 0.7 to 0.73.) These portfolio shifts also include owner-occupied housing, with the highest income group lowering its homeownership rate by 1½ percentage points and the lowest income group doing the reverse.

The last interesting finding is the change in household taxes. The cut in the tax rate on fully-taxed debt leads the highest income group to shift from riskier, tax-sheltered investments into the more heavily taxed debt instruments. As a result, their taxes rise by over $2 billion. Because the decline in taxes paid by other households is slight, total household taxes rise. A miniature Laffer curve exists, even without greater work effort.

Increase in the Tax Depreciation on Rental Housing

The Tax Act reduced the tax service life on rental housing from 35 to 15 years. As a partial offset, the depreciation method was reduced from double declining balance to 175 percent declining balance. On the one hand, this action will lower the rental user cost, thereby altering the tenure mode toward renting and increasing the desired rental quantity per renting unit. The demand for rental services will rise. On the other hand, the expected return on investments in rental property will increase, raising the supply of rental housing services. A partial equilibrium analysis could view the response from either side of the market; a general

equilibrium analysis incorporates both responses and constrains the market for rental services to clear in the new equilibrium. We shall use this disturbance (reduced taxation of rental housing) to illustrate the different estimates of impacts obtained when different variables are treated as endogenous.

In the first case, only the returns on and the portfolio demands for rental housing are endogenous. As can be seen in Table 10, the result is a $134.7 billion, or 25 percent, increase in the stock of rental housing. Supposedly the demand for rental housing services rises sympathetically and the stock of owner-occupied housing falls by an equal amount.

The second case considers the demands for rental housing services explicitly. When the returns to rental housing are held constant, the real user cost falls by a full percentage point. With ownership rates exogenous [see case (2a) in Table 10], consumption demand rises by $40 billion. With endogenous ownership rates [see case (2b)], the demand increases by $133.4 billion, which is remarkably (and only coincidentally) close to the $134.7 billion increase in portfolio demand in the first case. The average ownership rate falls by a full 5 percentage points. However, our demand equations for owner-occupied housing suggest that the total residential housing stock rises by $50 billion. Thus, the stock of nonresidential capital implicitly falls by this amount.

Finally, we have the full model or general equilibrium analysis [see case (3) in Table 10]. The rental user cost falls and the return on rental housing rises (at least for the highest income group). The supply and demand for rental services rise equally. As can be seen, the declines

TABLE 10: PARTIAL AND GENERAL EQUILIBRIUM IMPACTS OF AN INCREASE IN TAX DEPRECIATION FOR RENTAL HOUSING[a]

Income Class	Case (1) Portfolio Demand		Case (2a) Consumption Demand	Case (2b) Consumption Demand, Endogenous Ownership		Case (3) General Equilibrium			
	Rrh_i	A_i^{RH}	RH_i	o_i	RH_i	o_i	RH_i	Rrh_i	A_i^{RH}
0-10			13.5	-5.9	35.4	-2.0	11.0		
10-25			19.6	-5.2	67.7	-1.7	20.9		
25-50	0.66	47.6	3.7	-3.1	15.4	-1.0	4.7	-0.19	-15.5
> 50	2.23	87.1	3.5	-2.4	14.9	-0.7	4.4	1.47	56.5
Aggregate		134.7	40.3	-5.1	133.4	-1.7	41.0		41.0

Other Variables			
Rental User Cost	-1.04	-1.04	-0.33
Owner-Occupied Housing		-83.8	-32.0
Nonresidential Capital			-9.0

[a]Ownership rates, interest rates and user costs are in percentage points; dollar magnitudes are in billions of 1977 dollars.

in the rental user cost and ownership rate and the increase in the stock of rental housing are only a third as large as in the partial equilibrium cases. The stock of rental housing rises by 8 percent. About 80 percent of the increase is at the expense of owner-occupied capital and 20 percent, nonresidential capital.

The Combined Impact of the Tax Act of 1981

The results of combining the three components of the Tax Act are listed in Table 11. The major results of Table 7 -- the 6 percent rise in nonresidential capital and the sharp increases in business after-tax earnings and retentions -- are repeated. One significant difference is that the increase in nonresidential capital is almost entirely at the expense of owner-occupied housing. The ownership rate falls by over a percentage point, and the stock of owner-occupied housing decreases by 11 percent. In contrast, rental housing is reduced by less than one percent. Of course, this result could have been expected given the analysis of the increase in tax depreciation for rental housing.

The portfolio shifts shown in Table 11 are a mixture of those indicated in Tables 8 and 9. To illustrate, the business tax cut raised equity holdings of the highest two income classes significantly, while the cut in the tax on unearned income caused the $25-50 thousand group to increase equity holdings but the over $50 thousand group to lower them sharply. Thus Table 11 shows a large increase in equity holdings of the former and a small decrease for the latter. Further, Table 8 lists a shift in both tax-exempts and rental housing from the $25-50 thousand group to

TABLE 11: THE COMBINED IMPACT OF THE 1981 TAX ACT[a]

	Income Class					
	0-10	10-25	25-50	> 50	Total	%Δ
Households:						
Balance Sheets						
Equities	14.6	64.7	47.6	-7.5	119.4	6
Tax-Exempts	-	-	5.7	-5.7	-	-
Owner Housing	-9.6	-64.0	-41.6	-60.2	-175.4	-11
Rental Housing	-	-	-17.0	13.3	-3.7	-1
Taxable Debt	-12.7	-51.9	-41.6	22.6	-83.6	-3
-Mortgages	7.7	51.2	46.9	37.5	143.3	-8
	0	0	0	0	0	
Ownership Rate	-0.7	-1.7	-1.4	-2.1	-1.3	
Taxes	0.0	2.6	-0.2	-1.3	1.1	
Memo: Level of Wealth	720	2500	1240	1256	5716	

Nonresidential Business:

	Initial	Change	%Δ
Capital	3005.8	179.1	6
Output	1784.7	30.2	2
Taxes	80.7	-33.1	-41
Earnings After Taxes	24.3	9.1	38
Retained Earnings	64.5	16.7	26
Taxable Debt Rate	8.00	1.85	23

[a]Ownership rates and interest rates are in percentage points; dollar magnitudes are in billions of 1977 dollars.

those with higher incomes; Table 9 shows the reverse. Thus the shifts in Table 11 are quite small. Also, recall that ratio of the yields on tax exempt and taxable debt was lowered to 0.67 by the increase in business tax depreciation but raised to 0.73 by the cut in tax on unearned income. When the two tax changes are combined, the ratio is unchanged.

Table 12 lists the net (of depreciation) user costs of capital for corporate capital, rental housing, owner-occupied housing on average, and the components of the latter. The initial net user costs and those after the impact of the Tax Act are reported. Ignoring risk considerations and possible externalities, the net user costs should be equal across all types of capital for capital to be allocated efficiently in the economy. The Tax Act goes a fair distance toward achieving this equality. Prior to the Act, the net user cost for corporate capital was 2 percentage points above that for rental housing and 5 percentage points above the weighted average net cost for owner-occupied housing. After allowing for the impact of the Tax Act, the net costs for corporate capital and rental housing are equal, and that for owner-occupied housing is only three percentage points less. When the net cost for owner-occupied housing is examined by income class, one sees that the net cost is significantly below those of rental housing and corporate capital for the upper-middle and high income classes only.

TABLE 12: NET (OF DEPRECIATION) USER COSTS[a]

	Initial	After the Tax Act
Corporate Capital	7.2	6.5
Rental Housing	5.1	6.4
Owner-Occupied Housing[a]	2.3	3.5
By Income Class		
0-10	7.6	9.0
10-25	4.0	5.3
25-50	1.1	2.1
50+	0.2	1.4

[a]User costs are measured in percentage points; that for owner-occupied housing is a weighted average of those for the four income classes, the weights being their fraction of the initial stock held.

V. Conclusion

Our analysis suggests the following long-run impacts of the Economic Recovery Act of 1981 on the allocation of real capital. The stock of nonresidential capital increases by 6 percent, while the stock of housing is reduced by 8 percent. The latter is the result of a nearly 2 percentage point increase in real, pretax interest rates. The homeownership rate declines by almost 1½ percentage points because the Tax Act increases tax depreciation for rental housing as well as for industrial capital. As a result, the stock of owner-occupied housing falls by 11 percent, while the stock of rental housing is relatively unaffected (the increase in the number of renters offsets a decline in the quantity of rental services demanded per renter).

Corporate profit taxes fall by 60 percent; after-tax earnings rise by 25 percent; and retained earnings are up by 35 percent. Household taxes are roughly constant. By assumption, the full decline in taxes is matched by a decrease in government expenditures.

Some other assumptions should be emphasized. First, saving is unchanged. Second, there are no other output or growth effects. That is, resources are not more fully employed, labor participation does not rise, and the productivity increase that should accompany the 6 percent increase in industrial capital (in spite of the increase in real pretax interest rates) is not factored into the model. The existence of these "supply side" effects would (through an increase in saving) further

increase the stock of industrial capital and would dampen the decline in the stock of residential capital. In fact, residential capital could increase, although household consumption will surely be tilted from capital (housing and durables) services to other services.

One other result is worthy of mention. When the cut in the maximum tax rate on unearned (capital) income is analyzed in isolation, total household taxes on unearned income increase. The cut in the tax rate on interest from fully-taxed debt instruments leads high income households to shift from riskier, tax-sheltered investments into the more heavily taxed debt instruments. As a result, their taxes are estimated to rise by $2 billion (1977 dollars). Because the decline in taxes paid by other households is slight, total household taxes rise.

NOTES

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[1]The paper was part of a study of investment and saving sponsored by the American Council of Life Insurance and was published in 1980.

[2]For analyses of these factors, see the papers in this issue by Slemrod, Alm and Follain, and Hendershott and Hu.

[3]The model draws heavily upon Slemrod's work (1980, 1982).

[4]Covariances of returns are assumed to be zero.

[5]The tax depreciation rate is assumed to equal the economic depreciation rate (0.10) plus 0.01 minus 0.4π. The 0.01 reflects accelerated depreciation schedules, and the 0.4π captures the impact of historic cost depreciation and FIFO inventory accounting.

[6]Y is 1977 gross national product ($1972 billion) less housing services ($187 billion); ΣA^{OH} is owner-occupied housing plus land associated with it; ΣA^{RH} is other residential structures times 1.25 to account for land; K is nonresidential plant and equipment plus land not used with housing plus inventories; TXK is the sum of corporate profit tax liabilities and our estimate of corporate property taxes ($21.6). These data are from Flow of Funds (1980).

[7]Of course, the risk premiums are endogenous in the simulations, depending upon portfolio shares.

[8]The after-tax variance of the returns on corporate equity and rental housing is not affected by these changes.

[9]Feldstein and Fane (1973) have provided evidence that households do pierce the veil. Recent estimates of von Furstenberg (1981) suggest that households offset only two-thirds of changes in corporate saving.

[10]When Hendershott and Hu (1981b) calculated a partial equilibrium response of equipment demand to the 10-5-3 plan, they obtained a 14 percent increase. They also emphasized that the general equilibrium effect would be smaller.

[11]These data may understate the shift away from housing capital in that the relative expected inflation rate in house (asset) prices is assumed to be unchanged. It may be that this relative expected inflation rate would decline (from positive to, say, zero) in response to the negative impact on housing demand of the increase in real interest rates.

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