ISSN 0732 507X

Occasional Paper No. 136

A General Equilibrium Analysis of the 1986 Tax Reform Act on State and Local Governments: A Case Study of Missouri

Richard McHugh and L. Kenneth Hubbell

Metropolitan Studies Program
The Maxwell School of Citizenship and Public Affairs

Syracuse University
Syracuse, New York 13244-1090

May 1990

$5.00

SYRACUSE UNIVERSITY - SPRING 1990

Melvin A. Eggers — Chancellor

THE MAXWELL SCHOOL

John Palmer — Dean

THE METROPOLITAN STUDIES PROGRAM

David Greytak	Economics	Director
Michael Wasylenko	Economics	Associate Director
Larry Schroeder	Public Administration/Economics	Director DFM Project

SENIOR RESEARCH ASSOCIATES

Nancy Benjamin	Economics	Mary Lovely	Economics
Guthrie Birkhead	Public Administration	Jerry Miner	Economics
Stuart Bretschneider	Public Administration	Jan Ondrich	Economics
Beverly Bunch	Public Administration	John Palmer	Public Administration/Econ.
Jesse Burkhead	Economics/Public Admin.	Bruce Riddle	Academic Computing Specialist
James Follain	Economics	Seymour Sacks	Economics
Ali Galaydh	Public Administration	John Schnell	Economics
Vernon Greene	Public Administration	Thomas Selden	Economics
Kenneth Hubbell	Public Administration/Econ.	Jeffrey Straussman	Public Administration
William G. Johnson	Economics	John Yinger	Public Administration/Econ.
Bernard Jump, Jr.	Public Administration		

GRADUATE RESEARCH ASSOCIATES AND ASSISTANTS

Robert Carroll	Economics	Jing Li	Economics
Patricia Coleman	Social Science	Susan MacPhee	Public Administration
Mary Daly	Economics	Ashley Probart	Public Administration
James Dearborn	Public Administration	Jinghu Oh	Economics
Dan Gerlach	Public Administration	Maria Rendon	Public Administration
Lauria Grant	Economics	Taryn Rounds	Public Administration
Nigel Grant	Economics	John Ruggiero	Economics
Robert Guell	Economics	Gyan Sinha	Economics
Maurice Harris	Public Administration	Schuyler Tilly	Economics
Amy Hamburg	Public Administration	Kurt Thurmaier	Public Administration
Jocelyn Johnston	Public Administration	Laura Wheeler	Economics
Karl Knapp	Public Administration	Sung-Kull Yoo	Economics

STAFF

Margaret Austin	Administrative Assistant	Laura Sedelmeyer	Secretary
Martha Bonney	Word Processing Specialist	Henry Emmans	Librarian
Esther Gray	Administrative Secretary		

Foreword

In this paper, Richard McHugh and L. Kenneth Hubbell develop a computable general equilibrium model designed to simulate the implications of federal tax reform for state and local tax revenue in Missouri. While the analysis is necessarily simplified due to a lack of specific data, the model illustrates the complicated and both direct and indirect ways that federal tax reform can affect state revenues. The model finds the 1986 federal tax reform results in surprisingly large increases in state personal and corporate income tax revenues in Missouri. While it is easy to overemphasize the significance of the large revenue increases that the model produces, as evidenced by the current revenue problems that face New York State, the paper nonetheless illustrates the model building that is necessary to simulate the implications of federal tax reform on state and local governments. If further federal tax reform proposals, such as corporate and personal income tax integration and more reduction in personal income tax rates along with significant tax base expansion, take hold, states and localities will find general equilibrium analyses useful policy tools.

The paper was completed while Kenneth Hubbell, Professor of Economics at the University of Missouri-Kansas City, served as Visiting Professor of Public Administration and Senior Research Associate of the Metropolitan Studies Program at The Maxwell School of Syracuse University during the Spring 1990. Richard McHugh is Associate Professor of Economics at the University of Missouri at Columbia, and received his Ph.D. in 1978, from the Department of Economics and was at that time also affiliated with the Metropolitan Studies Program at The Maxwell School of Syracuse University.

Michael Wasylenko
Associate Director
May 1990

Table of Contents

List of Tables

D

A General Equilibrium Analysis of the 1986 Tax Reform Act on State and Local Governments: A Case Study of Missouri

Richard McHugh and L. Kenneth Hubbell[1]

I. Introduction

The Tax Reform Act of 1986 (TRA86) represented the most sweeping federal tax legislation since World War II. By dramatically lowering tax rates and concurrently increasing and redefining the tax base, TRA86 required all taxpayers to reevaluate the role of taxes in their decisions concerning how they earn, invest, and consume. Capital investment decisions for households and corporations were directly affected by numerous tax changes included in the 1986 Act. The Investment Tax Credit was eliminated, as was partial exclusion of taxation on capital gains. Additionally, the deductibility of interest expenses was substantially reduced and depreciation schedules for real property markedly lengthened in the legislation.

Predictably, tax modifications of this magnitude cause economic agents to reappraise their investment decisions. Changes in the depreciation rules for rental property for example, affects the profitability of a real estate investment; the reduction in marginal income tax rates lowers the subsidy to owner-occupied housing and to investment in municipal bonds. Such fundamental changes alter, both absolutely and relatively, the after-tax profitability of various investments; and as economic agents respond to the new regime, assets are shifted from one sector to another, and from one household to another.

---

[1]The authors would like to acknowledge the helpful comments of Edward Cupoli, Steven Gold and Joel Slemrod.

During the legislative debate on the TRA86, much was made of the direct impact of base broadening on the tax base of those state governments which use income taxes linked to the definitions in the IRS Tax Code.[2] In contrast, little attention was paid to the less obvious, and perhaps unintentional, indirect affects which these rule changes would have upon state and local government tax capacity. To illustrate the interrelatedness, fixed capital assets form the base of many local taxes, particularly the local property tax; thus, any tax reform-induced investment adjustment **indirectly** affects the tax base of local governments. Furthermore, to the extent that the tax bases of each level of government are altered in response to tax reform, equal yield tax rates also change. These changes, in turn, have additional feedback effects on the mix of assets and economic activity.

As is suggested by the foregoing discussion, the primary objective of this paper is to examine the potential indirect effects of the TRA86 engendered reallocation of assets upon the tax capacity of state and local governments. The selected general equilibrium model with endogenous financial behavior permits us to simulate how changes in tax policy induce households to alter the composition of their portfolios and the resulting implications of these choices upon the tax base of a "typical" state and local government. In this simple model we are able to simultaneously evaluate the "windfall" from base broadening, and the public sector costs or gains from the reallocation of capital.

Clearly, the impact which TRA86 has on a given state (local) government depends upon

---

[2]See Advisory Commission on Intergovernmental Relations, "The Tax Reform Act of 1986--Its Effect on Both Federal and State Personal Income Tax Liabilities," Staff Information Report (SR-8) (Washington, DC: ACIR, January 1988); Steven Gold, "The State Government Response to Federal Income Tax Reform: Indications from the States That Completed Their Work Early," *National Tax Journal*, XL(3) (September 1987):431-444; and Richard McHugh, "The Impact of Tax Reform on State Income Taxes," Working Paper 85-1 (Columbia, MO: University of Missouri, 1985).

that entity's tax structure and how its taxes interact with the Federal Income Tax. For example, some states tie their definition of taxable income to the federal definitions of taxable income; other states tie their tax liabilities to federal tax liabilities; and still others have no income tax. Since TRA86 expanded the base of the income tax, but simultaneously lowered rates far enough to reduce expected aggregate federal personal tax liabilities, it is obvious that the implications of the tax reform act on the revenue potential of income taxes will differ depending upon the institutional structure of the specific tax system.

In this study the model is applied to a state with the institutional tax structure of Missouri. The case of Missouri is of general interest for three reasons. First, the state ties its income tax structure (definitions of the tax base, itemized deductions, etc.) very closely to the federal definitions. Of the 42 states which now impose a general income tax, the majority follow this approach. Second, the state's corporate income tax is similarly tied to federal definitions. Forty of the forty-eight states primarily use federally reported net income for tax purposes. Because of these two features, many state governments stand to enjoy a large revenue windfall from base broadening. Third, the State of Missouri has a property tax "classification" system, which applies different assessment rates to property based upon its use. In Missouri, owner-occupied property is assessed at 19 percent of its market value, and multi-unit residential (rental) and commercial property at 32 percent. While property tax classification is not at this time the most prevalent type of property tax system, it is growing in use.[3] A property tax classification system is of interest in this context since it can magnify or mute the impact of shifts among types of assets on the local government tax base. Since multi-unit residential rental property and commercial property are taxed relatively heavily under this classification system, such property will accoun

[3]Since 1984, ten states have switched to a property tax classification system.

for a disproportionately large share of the property tax base relative to a uniform assessment system. Net shifts into and out of these assets will have a disproportionately large impact on the local tax base. In order to assess the independent quantitative impact of classification, we analyze the impact of TRA86 on Missouri's type of tax system with property tax classification and without classification.

In the following two sections, the general equilibrium model of financial behavior with expanded intergovernmental detail is presented. The data sources and parameterization of the model are described in section IV. Results of the simulation and the implication of tax reform for our "typical" state are described in section V. The last section contains some concluding comments on the model and its limitations.

II. Methodology

We model the revenue response to the Tax Reform Act using a computable general equilibrium (CGE) model. The model is an extension of that developed by Slemrod (1984) in which the financial behavior of individuals is endogenous, and the linkage between portfolio composition and real economic factors is made explicit.

In this general equilibrium model, the behavior of investors, consumers and producers are functionally described by equations which include behavioral parameters which simulate the response of economic agents to changes in price, income, risk, and other exogenous variables. The elements of alternative tax regimes enter directly into the expressions for the net rates of return to alternative assets, each household's budget constraint and the prices for commodities. In this model, consumers choose among goods, based upon relative prices and income. In addition, they must select an optimal investment portfolio, given net of tax rates of return for

different assets, and the variances in those rates of return. When tax rules (marginal rates and other relevant schedules) change, the vector of net rates of return also change, inducing asset substitution. Producers confront a production function which utilizes factors of production which they must purchase from households, and factor prices in turn (or gross rates of return) determine output prices and equilibrium consumption. Thus, changes in investors' optimal portfolios have general equilibrium impacts on the real sectors of the economy.

The tax capacity of state and local governments under any tax system can be functionally defined. The definitions of the local government tax base and the specification of an equation describing the government's response to the change in the tax base completes the model.

The process of specifying and simulating a general equilibrium model of this type requires three steps. First, the functional form of the household utility maximization problem, as well as all of the production relationships must be specified, yielding demand and supply functions for goods, factors and assets. Second, information on the sources and uses of income of representative taxpayers are obtained and used to impute hypothetical portfolios and consumption profiles to representative households. Given the functional form of the asset demand equations, and information on pre-reform household asset holdings and earnings, the demand functions for each asset are "calibrated" to be consistent with the observed aggregate asset holdings. This then forms the baseline for subsequent policy simulations. Third, the tax parameters confronting producers and consumers are then changed to be consistent with those of the new tax law (The Tax Reform Act of 1986). A new vector of rates of return, prices and tax rates which would restore equilibrium in all markets after TRA86 are then calculated.

III. The Model

A. Individual Investor Behavior

The form of the expected utility function is one which simplifies the analysis without loss of substance. In this analysis, the household consumes two goods, consumption goods and housing. They finance this consumption with earnings from labor inputs and earnings on his portfolio of financial investment. Given each households predetermined level of wealth, the investor chooses an optimal portfolio given the rate of return and the variance in the rate of return to each asset. We assume that the loss in utility associated with the risk to return of the chosen portfolio is separable from the consumption term. This form of the utility function implies constant relative risk aversion. In the interest of brevity, the details of this derivation are omitted and just the relevant functions are presented.[4] There are five assets in this model—taxable bonds (B), equity (E), municipals (M), real estate holdings (N), and owner-occupied housing (H).

$$E[U_i] = (\alpha C^{-u} + (1-\alpha)H^{-u})^{-1/u} - \frac{\beta R}{2W} \qquad (1)$$

where

C = consumption

H = housing services

W = total wealth

α and β are taste parameters and $1/(1+u)$ equals elasticity of substitution between C and H.

---

[4]For the derivation of this expression, see Joel Slemrod, *A General Equilibrium Model of Capital Income Taxation*, unpublished Ph.D. dissertation, Harvard University, 1980.

$$W = E + B + B + M + N + H \tag{1'}$$

H can stand for the value of owner-occupied property (HO) or rental property (HR), depending upon the household's (exogenous) tenure choice.[5] R measures the variance in the rate of return to the portfolio and (assuming covariances are zero) is defined as

$$R = \sigma_E^2(E(1-t)) + St_{Ea}\bar{E})^2 + \sigma_M^2 \cdot M^2 + \sigma_N^2(N(1-t) + St_{NA}\bar{N})^2 \tag{2}$$

where

σ_i^2 = Variance in return to asset i

$t = t^F + t^S - t^F t^S$ = marginal individual income tax rates, federal (t^F) and state (t^S)

t_{NA}, t_{EA} = average marginal income tax rates for all households on rental property and equity

S = the household's share of total income.

Given the functional form of the utility function and the income and wealth constraints, we can solve for the demand functions for each of the assets and goods. They are:

$$\underline{Housing}: \quad H = \frac{ay}{P_H^c + aP_H} \tag{3}$$

---

[5]A simplifying assumption of this model which has been made at this stage of our research is that we take the decision to own versus rent as exogenous. Crone has argued that the Tax Reform Act will make it more attractive to own versus rent. We know the probabilities of owning versus renting by income class from the 1980 Census. We apply those probabilities based upon 1986 equivalently defined constant dollar income levels. Once the decision to own or rent is set, we do not make allowance for a possible switch in the tenure decision. The biases from this simplifying assumption will be discussed in the conclusion. See Theodore Crone, "Housing Costs After Tax Reform," *Business Review of the Federal Reserve Bank of Philadelphia* (March/April 1987).

where "a" is a taste parameter equal to $((1-\alpha)/\alpha)^{\varepsilon}$, y is disposable income (defined below), and ε is the elasticity of substitution between housing and the composite consumption good. In the case of homeowners, H is interpreted as the flow of services from living in a house. For homeowners, the price of owning a dwelling unit is equal to

$$P_H = (r_b + t_p A_p^o)(1 - tD) - \pi + \delta_h \tag{4}$$

where r_b is the nominal rate of return on taxable bonds (the opportunity cost), π is the inflation rate, δ_h is the depreciation rate for housing, D is a variable set to 1 for itemizers (0 otherwise), t_p is the property tax rate and A_p^o is the assessment rate for owner-occupied housing.[6] We assume that there are no real capital gains in equilibrium.

For renters, the price of renting is equal to

$$R = r_N - \pi + \delta_N + t_p A_p^r \tag{5}$$

where A_p^r is the assessment rate for rental property, and r_N is the gross, pre-tax rate of return to investment in rental property, δ_N is the depreciation rate on rental property.

The demand for the consumption good is equal to

$$\underline{Consumption}: \quad C = \frac{y}{1 + aP_{Hi}^{1-\varepsilon}} \tag{6}$$

The asset demand equations are:

---

[6]For a property tax system which does not differentially assess property by type of property $A_p^i = A_p^j$ for all i, j.

$$\underline{\textit{Equity}}: \quad E = \frac{WU_C[r_E(1-\gamma t) - \pi \cdot g \cdot t - r_B(1-t)]}{\beta \sigma_E^2 (1-\gamma_t)^2} - \frac{st_{EA}E}{(1-\gamma)} \tag{7}$$

$$\underline{\textit{Municipals}}: \quad M = \frac{WU_C[r_M - r_B(1-t)]}{\beta \sigma_M^2} \tag{8}$$

where r_E is the rate of return on equity, r_M is the rate of return on municipal bonds, γ is the proportion of equity income subject to taxation, U_C is the marginal utility of consumption, and s is the individuals share of total income. The term π.g.t measures the rate of the inflationary capital gains tax, where g is the proportion of these gains taxed.

Rental Property:

$$N = \frac{WU_C[r_N(1-t) + \delta_N^* t - \pi \cdot g \cdot t - q - r_B(1-t)}{\beta \sigma_N^2 (1-t)^2} - \frac{St_{NA}N}{(1-t)}, \tag{9}$$

where S_N^* is tax depreciation for rental property.

The functional forms of the real estate holdings demand equation includes the variable, q. This term is included as a type of taste parameter. It is used to account for variations in the observed and optimal portfolio, that is, variances in the holding of real estate which cannot be accounted for by differences in the expected rates of return or the variances across assets. These differences are explained by a person's "talents" in real estate management. Greater talents would imply a greater expected rate of return. Other households, without this "talent," will have lower **expected** rates of return and consequently will hold less of their wealth in the form of real estate.

Disposable income is defined to equal gross income minus direct income taxes.

$$y = P_L \cdot L + r_E \cdot E + r_B \cdot B + r_N \cdot N + r_M \cdot M - \delta_H \cdot H - \pi W + Tran$$
$$- TAX(P_L \cdot L + r_b \cdot B + \gamma r_E \cdot E + r_n \cdot N - DED)$$

where Tran is equal to transfers received by an individual from the government (the dollar value of benefits from the public good), defined to equal the same share of all government revenues as gross income. This captures the lump-sum benefits of government spending. TAX is the income tax function (defined by the federal and state income tax rate structures) and DED is the level of deductions and exemptions.

B. The General Equilibrium Model

The general equilibrium portion of the model ensures that gross and net rates of return for each asset are set at a level which clears each market. Specifically,

$$\sum E_i = K_C(1 - b) \tag{10}$$

$$\sum N_i = \sum HR_i \tag{11}$$

and

$$\sum M_i = \bar{M} \tag{12}$$

where b is the fixed corporate debt/equity ratio, K_C is the total corporate capital stock, ΣN_i is the sum of investor demand for rental property holdings, ΣHR_i is the demand for rental housing by tenants, and $\bar{M}$ is the fixed supply of municipal bonds.

To ensure that the gross rates of return to the holders of the firm's stocks and bonds are equal to the net of direct tax returns to the physical capital, we specify a corporate earnings exhaustion equation.

$$br_b + (1-b)r_E = f_K - \delta_C - t_p A_p^i - t_C(f_K - br_b - \delta_C^* - t_p A_p^i w) + I \quad (13)$$

where f_K is the marginal productivity of capital, δ_C is the real rate of capital depreciation, δ_C^* is the tax depreciation of capital, A_p^i is the assessment rate on commercial and industrial real estate, and w is the proportion of a firm's real property which is subject to the local property tax (taken to equal the share corporate capital in land and structures). The variable I equals the effective annual investment tax credit rate, defined as the weighted average of the investment tax credit applicable to various types of capital investment divided by the expected usable life of this capital.[7]

Assuming a Cobb-Douglas production function for the composite consumption good, a fixed supply of labor, and the estimated level of corporate capital ($K_C = (E/(1-b))$, we can solve for the marginal productivity of capital, f_K.

C. The Public Sector

For simplicity, we assume that the federal government raises revenue from just two sources: the Individual Income Tax and the Corporation Income Tax.[8]

$$FEDREV = FEDINC + FEDCOR \quad (14)$$

Total Federal Individual Income tax revenues (FEDINC) are found through the simple simulation of taxable income (which is determined by the tax laws and the information on tax return), given the rate structure and other Tax Code settings (exemptions, etc.) tax liabilities.

---

[7]In an equilibrium model, if capital is replaced once every N years, the corporation would be eligible for 1/N of the investment tax credit each year.

[8]In fiscal 1987, these two sources accounted for 85 percent of nonsocial insurance revenue.

Federal Corporation Income taxes are equal to

$$FEDCOR = t_C^F K_C (f_K \quad br_b \quad \delta_C^* \quad t_p A_p^i w) \quad (IK_C/L) \tag{15}$$

The state government is assumed to raise its revenue from the individual and corporate income taxes and the sales tax.[9]

As with the federal government, individual income taxes are calculated by the simple simulation of liabilities given rates and tax law definitions. Sales taxes are equal to

$$STASAL = p \cdot r_S \cdot C \tag{16}$$

where p equals the proportion of all sales which are currently taxed, and r_S is the state sales tax rate.[10] State corporate tax revenues are equal to

$$STACOR = t_C^S \left[K_C (f_K \quad br_b \quad \delta_C^* \quad t_p A_p^i W) \quad FEDCOR) \right]$$

Local governments raise their revenue from the sales tax and the property tax.[11]

$$LOCTAX = LOCSAL \cdot LOCPRO \tag{17}$$

Local sales taxes are determined just like state sales tax revenues.

$$LOCSAL = p \cdot r_L \cdot C \tag{18}$$

---

[9]In our case study state, Missouri, these three sources raise 87 percent of General Revenue funds. In the U.S., these taxes raise 85 percent of all state revenues.

[10]p is set to equal .60.

[11]In Missouri, these two revenue sources raise 88 percent of all local revenues. In the U.S., it is 90 percent.

Local property tax revenues equal the sum of taxes on owner-occupied, rental and industrial property.

$$LOCPRO = t_P \cdot A_p^o \cdot H + t_P \cdot A_p^r \cdot N + t_K \cdot A_p^i \cdot K_C \cdot w \qquad \textbf{(19)}$$

IV. Imputation of Asset Holdings and Recovery of Preference Parameters

The basic source of data for the imputation of household characteristics and their holdings of assets is a sample of U.S. Individual Income Tax returns. Our base year for this analysis is 1986.[12]

Briefly, the individual income tax returns include information on interest income (from which we can estimate bond holdings based upon average interest rates on taxable bonds), dividend income (from which we can estimate equity holdings based upon dividend payout rates and price-earnings ratios, rental income (from which we can estimate real estate holdings based upon rent to value ratios),[13] existence of either mortgage interest or property tax deductions homeowners. A random assignment of homeownership is made among the remaining to ensure that income class average ownership rates match those reported in the 1980 Census. There are assumed to be two types of taxable bonds—U.S. government and corporate. The supply of U.S. government bonds is assumed fixed. Holdings of municipal bonds are solved for directly from

[12]We use a stratified sample of 456 tax returns from the IRS Individual Income Tax Return files. Higher proportions of returns are taken from income classes with fewer returns.

[13]In 1986, there were large numbers of individuals with negative net rental income. These persons obviously did not hold negative amounts of real estate. Since we do not have gross rental income information, we measure rental income flows as the absolute value of net rental income, as Slemrod had done, implying that large net losses are associated with large holdings. Although not entirely satisfactory, it is the best that can be done, given the data constraints. See Joel Slemrod, "A General Equilibrium Model of Taxation that Uses Micro-Unit Data: With an Application to the Impact of Instituting a Flat-Rate Income Tax," NBER Working Paper No. 1461 (September 1984).

the utility maximization model, given the holdings of other assets.[14] A small amount of wealth is held in the form of demand deposits, cash and time deposits. Holdings of each are taken to be proportional to income and are made consistent with reported aggregates.

Having imputed values for owner-occupied property, bond holdings and equity holdings, we can solve equations (1'), (7) and (8) simultaneously for W, M and $U_c\beta$. Given U_C, we can for β, the risk aversion parameter. Having determined W, and given our imputation for N, we can solve for the subjective talent factor for the holding of real estate, q. Finally, given C, Y and H, we can solve for the taste parameter, a.

Once the model has been initialized and conforms to control aggregates, we reparameterize the tax system to reflect the new tax regime and solve the system for the equilibrium vector of returns.[15] The parameterized values used are detailed separately for ease of presentation.[16]

---

[14]See Slemrod, "A General Equilibrium Model of Taxation that Uses Micro-Unit Data," for details.

[15]We have taken no explicit account of the provision which limited the offsetability of regular income by passive real estate loss, although much has been made of its potential impact. To see why, one should consider that the shelter provided by the limited partnerships only had value because of the generous depreciation rules under pre-TRA86 rules, which we account for in our model. The reforms in TRA86, in particular the revisions to the tax depreciation schedules for rental property, have substantially reduced the potential tax loss from passive investment in real estate, so the passive loss limit would be expected to have little independent effect, as Burman, Neubig and Wilson have recently shown. Other provisions, such as the carry-forward of excess passive loss and the allowability of up to $25,000 in losses to offset other income if the taxpayer "actively participates" in the real estate activity, further diminish the provisions independent effect. See Leonard E. Burman, Thomas S. Neubig and D. Gordon Wilson, "The Use and Abuse of Rental Project Models," in *Compendium of Tax Research 1987* (Washington, DC: Office of Tax Analysis, Department of the Treasury, 1987).

[16]The system is parameterized in the following way. The yields on bonds, equities, rental property and municipals, respectively, were set at 9.02 percent, 10.50 percent, 11.00 percent and 6.80 percent. The variance of these yields were equities (.0265), rental property (.0097) and municipals (.0175). In the utility function, the elasticity of substitution between the consumption

V. Results

A. The Impact of TRA86 on Governmental Revenue Capacity

The percentage change in the holdings of assets, for a tax system with property tax classification and without the classification system, are shown in Table 1. Given the assumption of fixed wealth and the assumption of a fixed supply of municipal bonds and U.S. government bonds, the impact of tax reform on the desired distribution of asset holdings comes down to a question of the relative impact on the taxation of residential property (rental and owner-occupied) versus nonresidential productive capital in the corporate sector. There are three notable results. First, the reshuffling of assets is not large. The largest percentage movement in equilibrium assets is that for rental property, which loses 2.7 percent and 3.0 percent in the nonclassification and property tax classification schemes respectively. At least among broad categories of assets,

good and housing is set to equal 0.5. The fixed debt-equity ratio is set at 0.49. The depreciation rates for housing is .013, for rental property, 0.247 and corporate capital, .0800. (See C.R. Hulten and F.C. Wykoff, "The Estimation of Economic Depreciation Using Vintage Asset Prices: An Application of the Box-Cox Power Transformation. *Journal Econometrics*, April 1981, 15(3), pp. 367-96; and Don Fullerton, Robert Gilette and James Mackie, "Investment Incentives and the Tax Reform Act of 1986," in *Compendium of Tax Research 1987* (Washington, DC: Office of Tax Analysis, Department of the Treasury, 1988).) The annual level of tax depreciation before and after tax reform is set at .0459 and .0259 for rental property, and .0984 and .0816 for corporate capital. The expected life of capital is set to 15 years, consistent with the depreciation rate and a 20 percent disposal requirement. The investment tax credit is set to equal .069 before reform (less than the statutory .10 to account for capital expenditures on noneligible capital) and 0 after reform. (See Dale Jorgenson and Martin A. Sullivan, "Inflation and Corporate Capital Recovery" in *Depreciation, Inflation and the Taxation of Income From Capital* (Washington, DC: Urban Institute Press, 1981).) The tax exposure coefficient, γ, for corporate earnings equals .625 before and 0.75 after reform. (See Slemrod, *A General Equilibrium Model of Capital Income Taxation.*) The proportion of inflationary capital gains subject to taxation equals 0.4 before reform and 1.0 after. The federal rates and allowances are consistent with pre-reform and fully phased-in post-reform levels. The sales tax rates are 4.225 (state) and 1.00 (local). The property tax rates are .03303 (nonclassification system) and .04892 (classification system). The state corporate income tax rate is .05.

TRA86 will not have had a tremendous disruptive impact on the aggregate equilibrium portfolio. Second, the clear winner from TRA86 is owner-occupied housing. It is the only asset among the four in which the equilibrium aggregate value increases. Although the implicit subsidy to owner-occupied housing was reduced by TRA86 by the reduction in marginal rates, this sector was unaffected by the more direct alterations to the structure of the tax code. For example, rental property, which falls by 2.7 percent to 3.0 percent as a result of TRA86, was adversely affected by the lengthening of tax lives and the elimination of the accelerated form of tax depreciation. The net of tax returns to corporate capital investment was directly affected by the elimination of the investment tax credit. Third, the interaction of TRA86 with the property tax classification system is not much different than the nonclassification system. TRA86 is slightly less favorable to rental property and slightly more favorable to owner-occupied housing than under the nonclassification system.

TABLE 1
PERCENTAGE CHANGE IN ASSET HOLDINGS RESULTING FROM TAX REFORM
(in percents)

	Non-Classification	Classification
Equity	-0.5	-0.7
Bonds	-0.2	-0.2
Owner-Occupied	+1.3	+1.5
Rental Property	-2.7	-3.0

The impact of TRA86 on the revenues of federal, state and the local government are shown in Table 2.

TABLE 2
PERCENTAGE CHANGE IN REVENUES RESULTING DIRECTLY FROM TAX REFORM
(in percents)

	Non-Classification	Classification
Federal:	-5.7	-5.8
Individual Income	-6.8	-6.8
Corporate Income	-1.1	-1.2
State:	+17.8	+17.8
Individual Income	+32.9	+32.9
Corporate Income	+33.8	+33.6
Sales	-0.4	-0.4
Local:	+0.1	-0.2
Property	+0.3	-0.2
Sales	-0.4	-0.4

As anticipated, state governments are the clear winners from the tax reform. Individual income taxes increase by 32.7 percent. Because the particular state tax system analyzed is one which ties the definition of the adjusted gross income to the federal definitions, the state government directly reaps the benefits of base broadening, increasing revenues (in the absence of legislation which would offset these increases). In addition, the State of Missouri allows the full deductibility of federal individual income taxes from state taxable income and the reduction in aggregate federal individual income taxes adds additional money to the state's windfall.[17]

[17]These revenue estimates are higher than most existing estimates of the "windfall" to state governments from TRA86. While some of the difference can surely be accounted for by differences in technique, this is not likely to be a major source of the difference since there has not been a dramatic change in the aggregate portfolio. It is more likely that the difference is attributable, in part, to our assumption of no change in capital gains realization behavior for the

The state corporation income tax increase is also substantial—up by 33 percent. Just as in the case of the Individual Income Tax, the state's corporate income tax base was broadened by the changes in tax depreciation schedules, but the state's corporate income tax **rate** did not automatically fall to offset the increased revenues in the initial simulations. Although this increase appears high, note that the revenues from the federal corporate income taxes do not change much even though the old rate (46 percent) is 40 percent above the post reform rate (33 percent).

The federal government is shown to lose revenue as a result of TRA86. The Individual Income Tax revenue falls by nearly 7.0 percent while Corporate Income Taxes are down by just over 1.0 percent. The overall decrease in revenues is just shy of 6.0 percent under both the classification and nonclassification system.[18]

Local governments are impacted very little by the tax reform. The overall stability of the revenue capacity of local governments is the net result of changes in composition of the property tax base. As shown, the aggregate equilibrium level of owner-occupied housing in the nonclassification system increases by 1.3 percent, and that for rental property decreases by 2.7 percent. As a result, owner-occupied property's equilibrium share of the total tax base would grow from 69.2 percent to 70.1 percent while rental property's share would fall from 31.0 percent to 21.1 percent.

Since a classification system can magnify the impact on the revenue capacity of changes

---

1986 tax return year. That year, capital gains were quite high. See Gold, "The State Government Response to Federal Income Tax Reform"; ACIR, "The Tax Reform Act of 1986--Its Effect on Both Federal and State Personal Income Tax Liabilities"; and McHugh, "The Impact of Tax Reform on State Income Taxes."

[18]The Individual Income Tax loss estimates are about in line with the Treasury's own estimates, while post-reform corporate tax revenue is a bit below the Treasury's estimates.

in the value of property which is heavily weighted, the shift from rental to owner-occupied property could be expected to weaken the local tax base. This occurs in these simulations, but the impact is slight, turning the slight 0.3 percent increase in property taxes to a 0.2 percent decrease. In sum, the initial impact of TRA86 will be to slightly decrease federal government revenues, greatly increase state government revenues, and local governments are essentially, on net, unaffected.

B. The Impact of Equal-Yield Response

Given the changes in the values of the tax base at all levels of government, these governments can change tax rates to maintain fixed revenues.[19] Each level of government has any number of options for increasing or decreasing revenues. Here, we assume that the federal government meets its equal yield constraint with a proportionate increase in all marginal individual income tax rates; the state, by increasing exemption and standard deduction levels. Local governments' property tax rates are not changed since the revenue impact of TRA86 was so slight. This also allows us to isolate the impact of the federal and state response on local governments.[20]

As indicated, the federal government returns to equal yield by increasing marginal rates (by about 7.5 percent). The state government reduces their yield to restore equilibrium by increasing the level of the exemption and standard deduction. These are allowed to increase by

---

[19]Clearly, the governments retain the option of increasing or decreasing the level of spending, given the changes in the relative prices of the public goods and the changes in disposable income at all levels of government. Demand for public services might also change in response to the changing concentrations of asset holdings. However, here we elect to maintain the equal-yield assumption in order to isolate the simple effects of reform on tax bases and rates under TRA86.

[20]See Steven Gold, "The State Government Response to Federal Income Tax Reform: Indications from States That Completed Their Work Early," for a discussion of the impact of TRA86 reform upon the states.

nearly 75 percent. The impact of these changes is to reduce the equilibrium level of bonds, equities and rental property slightly (by 0.7 percent or less), and to further increase the level of owner-occupied housing (+0.6 percent). The reason that owner-occupied housing is rendered even more preferred by this response is that the effective combined state and federal marginal tax rate increases slightly for most taxpayers after reform. The federal marginal rate increases are partly offset by the increased exemptions and standard deductions. The lowering of taxable income at the state level pushes some households (particularly those at lower income levels) back to lower state marginal rate brackets. The net effect is a slight lowering of MTR's at lower income levels and an increase for middle and upper income levels. The majority of households face higher marginal tax rates. The implicit subsidy from the nontaxation of the returns to owning a home increases, leading to the growth in the share of assets held by owner-occupied housing. As before, the net impact on local governments tax capacity is minuscule, with the increase in the holdings of taxable owner-occupied housing offset by reductions in rental housing.

VI. Conclusion

In this paper, a general equilibrium model with endogenous financial behavior is used to assess the impact of the Tax Reform Act of 1986 on the equilibrium distribution of assets held by consumers. The primary objective of this simulation is to evaluate how the changes in the definition of the tax base, and, in particular how changes in the equilibrium distribution of assets in the household portfolio, would impact the tax base of a "typical" state and local government.

We find that TRA86 has favorable implications for the equilibrium levels of the tax base for a state government with a tax structure like Missouri's, which is not atypical. The "windfall" for states comes as no surprise since the definitional broadening of the federal tax base means

a broadening of the state tax base for states which, like our case study state of Missouri, tie their definitions of taxable income to that of the federal government.

The tax capacity of local governments, however, appears to be remarkably unaffected by TRA86. The reform favors one component of the property tax base—owner-occupied housing—and has an adverse impact on another component of the tax base—rental property. Together, the impacts cancel each other out nicely. Not unexpectedly, we find that the classification system is more detrimental than the nonclassification system, but even here the impacts are slight. Finally, even the response of state and local governments to the changes in their taxable capacity do not have much impact on local governments.

This model represents a step toward the linkage of many levels of government into one portfolio allocation model. For reasons of simplicity in exposition, the model is burdened with many simplifications. First, none of the dynamic implications (e.g., the impact on wealth accumulation and savings) have been examined. Second, we have used a simple governmental decision rule (no change in spending). Other decision criteria are possible although much more difficult to incorporate into this model. Our consideration of only one state or local government also begs the question of the locational implications of tax reform. These all represent ways in which this model may be enhanced to give a clearer picture of the impact of tax reform on all levels of government.