SALES TAXES, INVESTMENT, AND THE TAX REFORM ACT OF 1986**

DAVID JOULFAIAN* AND JAMES MACKIE*

ABSTRACT

Contrary to the conventional view on consumption taxes, state and local sales taxes extend to the acquisition of capital assets and are especially burdensome on equipment. These taxes partially offset allocational distortions caused by tax provisions present prior to the Tax Reform Act of 1986 (TRA). Consequently, the TRA's modifications, especially the repeal of the investment tax credit, do less to improve the uniformity of the tax treatment of alternative investments than suggested in earlier work. This makes it less likely that the TRA generated an overall welfare gain.

PREVIOUS analyses of the effects of taxes on investment incentives have included federal, state, and local income taxes and sometimes even state and local property taxes. These earlier studies, however, abstracted from a potentially important tax which can affect investment incentives—state and local sales taxes. Contrary to the conventional view on consumption taxes, state and local sales taxes extend to the acquisition of capital assets. They are far from uniform across investments, being especially burdensome on equipment. Thus, not only might state and local sales taxes contribute to the overall average tax burden on marginal investments, they also might affect the uniformity of tax rates across investments and so modify conclusions about the 1986 Tax Reform Act (TRA).

Conventional wisdom has it that the TRA had an ambiguous effect on the efficiency of capital income taxation. On the one hand, the TRA repealed the investment tax credit (ITC) and made other changes likely to improve the uniformity with which alternative assets would be taxed. On the other hand, the TRA increased the overall tax burden on investment and thus added to the existing distortion at the present consumption-future consumption margin (see Auerbach, 1987; Gravelle, 1989; Fullerton, 1987; Fullerton, Henderson, and Mackie, 1987). Using a comprehensive computable general equilibrium model of the U.S. economy to evaluate the TRA's overall effect on welfare, some have argued that the TRA's allocational benefits dominate its intertemporal losses, so that overall it is likely that the TRA's capital income tax provisions generated modest welfare improvements (see Fullerton et al., 1987; Fullerton and Mackie, 1989; Goulder and Thalmann, forthcoming).

Our calculations suggest that other analyses of the TRA may have over-estimated the movement towards a uniform tax system by neglecting the effects of state and local sales taxes. We evaluate the TRA using the model of investment incentives and the general equilibrium model developed in Fullerton and Henderson (1989), extended to include the effects of state and local sales taxes. Because sales taxes are heaviest on equipment, they offset partially the pre-TRA allocational distortions caused by the ITC. Consequently, the TRA's repeal of the ITC does less to improve the uniformity with which alternative investments are taxed. Including state and local sales taxes, therefore, makes it much less likely that the TRA generated an overall welfare gain.

The remainder of the paper is organized as follows. The first section describes our estimates of state and local sales tax rates on capital assets. The second section describes our model of investment incentives, which includes sales taxes, and the third section presents the results of our calculation of the effect of sales taxes on measured investment incentives. In the next section we present the results of our general equilibrium welfare calculations. In the last section we summarize and qualify our findings.

*Office of Tax Analysis, U.S. Treasury Department, Washington, DC 20220.

Calculation of Effective State and Local Sales Tax Rates

It is well-known that sales taxes are an important source of revenue for state and local governments. Currently, sales taxes are levied in 45 states[1] and the District of Columbia and generated well over $100 billion in revenues in 1987. Sales tax rates vary across states, ranging from about 7.5 percent in New York to zero in Delaware, Montana, New Hampshire, and Oregon. Table 1 provides 1987 data on combined general state and local sales tax rates for each of the 50 states and the District of Columbia. The average general sales tax rate, weighted by the share of U.S. gross state product (GSP), was about 5.89 percent in 1987.

What is less known is that sales tax revenue derived from business purchases is also significant. States and localities tax not only consumer expenditures, but also tax selected business purchases, including purchases of durable equipment, building materials, services, fuel, and other intermediate goods and raw materials. Ring (1989) and Uhimchuk (1986) estimate about 40 percent of state sales tax revenues are paid by businesses. These studies suggest that businesses pay over $40 billion in state and local sales taxes—an amount equivalent to roughly 40 percent of federal corporate income tax receipts. Thus, sales taxes represent a potentially important disincentive to certain business purchases, including purchases of some types of capital assets.

TABLE 1
COMBINED STATE AND LOCAL GENERAL SALES TAX RATES

State	Rate	State	Rate
Alabama	7.00	Nebraska	5.50
Alaska *	1.39	Nevada *	5.79
Arizona *	6.90	New Hampshire *	0.00
Arkansas	5.00	New Jersey *	6.00
California *	6.15	New Mexico	5.57
Colorado	5.88	New York *	7.54
Connecticut *	7.50	North Carolina *	5.00
Delaware *	0.00	North Dakota	6.00
District of Colombia *	6.00	Ohio *	5.87
Florida *	5.26	Oklahoma	6.65
Georgia *	4.11	Oregon *	0.00
Hawaii *	4.00	Pennsylvania *	6.00
Idaho *	5.00	Rhode Island *	6.00
Illinois *	7.13	South Carolina *	5.00
Indiana *	5.00	South Dakota	5.16
Iowa	5.00	Tennessee *	7.68
Kansas	5.00	Texas *	7.26
Kentucky *	5.00	Utah *	6.25
Louisiana *	7.00	Vermont *	4.00
Maine *	5.00	Virginia *	4.50
Maryland	5.00	Washington *	7.80
Massachusetts *	5.00	West Virginia	5.00
Michigan *	4.00	Wisconsin *	5.10
Minnesota	6.53	Wyoming	4.00
Mississippi *	6.00	Simple Mean	5.15
Missouri	5.06	Weighted Mean[1]	
Montana *	0.00	All Jurisdictions	5.89
		Sample Jurisdictions[2]	5.91

* sample jurisdictions.
[1] weighted by share of total gross state product.
[2] weighted mean for the 35 sample jurisdictions.

Source: Authors' calculations as described in the text.

The Sales Tax Treatment of Assets

There is considerable variation in statutory provisions applicable to purchases of assets. Equipment purchases generally are taxable in all 45 states which impose a sales tax. Purchases of equipment often remain taxable even though the assets might be used to produce final products that are themselves subject to the sales tax. Some states, however, provide special exemptions or lower tax rates to certain assets used directly in agriculture, in manufacturing, and in public utilities. Equipment used in agriculture is accorded a limited exemption in 25 states and a lower sales tax rate in seven states. Industrial machinery is partially tax-exempt in 28 states and fully exempt in 10 states (Due and Mikesell, 1983). In addition, rolling stock, vessels, aircraft, and select trucks and buses also often are exempt when they are used in interstate commerce.[2]

Unlike equipment, structures generally are exempt from sales taxes. Nevertheless, sales taxes can still affect the acquisition cost of structures by raising the cost of building components. Building materials such as concrete, for instance, are subject to the sales tax. Many types of structures, therefore, are subject to an implicit sales tax. In contrast, land and inventory purchases are exempt from the sales tax.[3]

Representative Average State and Local Sales Tax Rates By Asset

We construct representative average sales tax rates for each of the 38 assets used in the Fullerton-Henderson (1989) general equilibrium model. The assets include 20 types of equipment, 14 types of nonresidential structures, residential structures, land, and inventories (see Table 2). We begin by gathering data on sales tax rates and special exemptions from such sources as Commerce Clearing House State Tax Guide, Advisory Commission on Intergovernmental Relations (1988), and Due and Mikesell (1983). To make our study manageable we focus on 30 jurisdictions (29 states and the District of Columbia) as well as five states with no sales taxes. The sample jurisdictions are indicated in Table 1 by an asterisk. These 35 jurisdictions represent over 82 percent of the U.S. GSP. The GSP weighted average general sales tax rate in these 35 jurisdictions is 5.91 percent, virtually identical to the weighted average 5.89 percent tax rate for all states. Consequently, we do not believe that we seriously bias our calculations by limiting our attention to only 35 jurisdictions.

Our sales tax rates include taxes levied at both the state and the local levels. The state level tax is simply the statutory rate. Tax rates vary, however, from one county or city to another within a state. For each of our 34 sample states, therefore, we compute an average local sales tax rate as the population weighted average of the rates in each locality (county/city).[4] We add the state rate to the representative local rate in constructing our estimate of each jurisdiction's "typical" or general sales tax rate.

To derive our representative national sales tax rate for each type of equipment, we start by estimating tax rates by asset and industry within each sample jurisdiction. To do this we combine our estimate of each jurisdiction's "typical" sales tax rate for business purchases with that jurisdiction's statutory exceptions. Since we include 20 types of equipment used in each of 18 industries, in each of 35 sample jurisdictions, this gives us a 20 by 18 by 35 matrix of sales tax rates by asset, industry, and jurisdiction. In the next step of our calculation we obtain a national weighted average tax rate by asset and industry using GSP by industry by jurisdiction to construct weights. This gives us a 20 by 18 matrix of tax rates that vary by asset and industry. Finally, we construct the effective sales tax rate for each asset by averaging across industries using capital stock weights obtained from Don Fullerton.

We use a similar approach to construct an effective sales tax rate for each of the 15 types of structures in our study. The only difference is that for structures we estimate implicit sales tax rates by accounting for sales taxes paid on the com-

TABLE 2
EFFECTIVE SALES TAX RATES BY TYPE OF ASSET

	Asset	Tax Rate
	Equipment	
1	Furniture and fixtures	0.059
2	Fabricated metal products	0.046
3	Engines and turbines	0.051
4	Tractors	0.052
5	Agricultural machinery	0.018
6	Construction machinery	0.058
7	Mining and oil field machinery	0.048
8	Metalworking machinery	0.028
9	Special industry machinery	0.032
10	General industry machinery	0.039
11	Office and computing machinery	0.059
12	Service industry machinery	0.059
13	Electrical machinery	0.048
14	Trucks, buses, and trailers	0.041
15	Autos	0.057
16	Aircraft	0.019
17	Ships and boats	0.014
18	Railroad equipment	0.002
19	Instruments	0.059
20	Other equipment	0.059
	Average*	0.042
	Nonresidential Structures	
21	Industrial buildings	0.017
22	Commercial buildings	0.019
23	Religious buildings	0.000
24	Educational buildings	0.000
25	Hospital buildings	0.000
26	Other nonfarm buildings	0.016
27	Railroads	0.013
28	Telephone and telegraph	0.017
29	Electric light and power	0.015
30	Gas facilities	0.012
31	Other public utilities	0.010
32	Farm structures	0.022
33	Mining, shafts, and wells	0.007
34	Other nonbuilding facilities	0.014
	Average*	0.016
	Other Assets	
35	Residential structures	0.022
36	Inventories	0.000
37	Business land	0.000
38	Residential land	0.000
	Overall average*	0.013

Source: Authors' calculations as described in the text.
* Weighted by capital stock share.

ponents that make up a finished building. To do so we combine statutory provisions with an estimate of the proportion of the value of each structure that is subject to the sales tax obtained from the 1977 U.S. input-output table (U.S. Department of Commerce, 1984).

Table 2 presents the estimates of effective sales tax rates for each of 20 equipments, 15 structures, inventories, and land. Effective sales tax rates range from a high of 5.9 percent, as in the case of furniture and fixtures, to a low of zero on inventory, land, and certain structures. On average, equipment faces a 4.2 percent sales tax rate, while structures face a rate of 1.6 percent, with zero rate on land and inventories.

These estimates, however, are subject to certain limitations. First, we may have been too restrictive in interpreting state statutes, especially, as we ignore tax "holidays." Second, certain exemptions from sales taxation depend on the industrial classification at the firm level and not at the (narrower) establishment level as applied in this paper. Last, but not least, we do not account for tax evasion and noncompliance. Unfortunately, the estimates for each type of asset cannot be directly verified. As a check, however, we use our average sales tax rate on equipment and structures, in combination with NIPA business investment data, to estimate that investments generate sales tax revenue of roughly $25 billion annually. This corresponds to 20–25 percent of total state and local sales taxes paid, and is well below the 40 percent share reported in Ring (1989) and Uhimchuk (1986).

Measuring Investment Incentives

The investment incentive model we use is described in more detail in Fullerton (1987), and we offer only a brief description. It is based on the neoclassical rental rate approach of Hall and Jorgenson (1967), and abstracts from risk.[5] It captures the effects of personal and corporate income taxes and property taxes at the federal, state, and local levels, as well as depreciation allowances and credits. Taxes differ from asset to asset, and also differ depending on whether the investment is undertaken by a corporation, a noncorporate business, or by an individual investing in owner-occupied housing. With our modifications the model also captures the effects of sales taxes which differ by asset.

The Cost of Capital

Without State and Local Sales Taxes—The neoclassical approach exploits the competitive profit maximizing condition that the marginal investment will yield a cash flow whose present value is just sufficient to cover its acquisition price. This equilibrium is solved for the social return on investment, gross of tax but net of economic depreciation. This return is called the cost of capital. For a corporate firm the cost of capital on a marginal investment of $1, ρ, is

$$\rho = \{(r - \pi + \delta)/(1 - u)\} (1 - k - auz) + w - \delta \quad (1)$$

where r is the firm's nominal discount rate, π is the (constant) expected rate of inflation, δ is the geometric rate of economic depreciation, u is the statutory corporate tax rate, k is the rate of investment tax credit, a is the percent of the asset entitled to be written off as depreciation, z is the present value of tax depreciation allowances on $1 of basis, and w is the local property tax rate.[6] The discount rate, inflation rate, and statutory corporate income tax rate are constant across assets in the corporate sector. The other parameters (k,z,w,a, and δ) vary by asset.[7]

With State and Local Sales Taxes—Sales taxes paid on the purchase of a piece of equipment raise the acquisition cost of the investment and thereby raise the investment's cost of capital. For a particular equipment, let t_s stand for the applicable sales tax rate separately identifiable at the point of sale. Let f stand for the present value of the recovery allowances granted for sales taxes paid on a $1 investment in this asset (see discussion in "Data and Parameters" below). The present value of the cost of the sales tax to the investor, therefore, is $t_s(1 - f)$. To account for the sales tax, the cost of capital expressed in equation (1) must be augmented by $t_s(1 - f)$, and is written as:

$$\rho = \{(r - \pi + \delta)/(1 - u)\} \{1 - k - auz + t_s(1 - f)\} + w - \delta. \quad (2)$$

Implicit in equation (2) is the requirement that the basis for the investment tax credit, for normal tax depreciation allowances, and for property taxes excludes the cost of the sales tax. The taxpayer recovers the cost of the sales tax using separate rules summarized in our f parameter.

Sales taxes are not explicitly paid on the purchase of a building or other structure. Nonetheless, sales taxes are paid on the purchase of many components which are used to construct the structure. These sales taxes raise the purchase price of the asset. Because sales taxes are implicitly reflected in the price of the structure, and not directly assessed at the point of sale, it is not possible for tax authorities to separate them from other costs. Instead, for investment in structures, sales taxes simply raise the basis on which normal cost recovery allowances and property taxes are determined. Consequently, unlike with equipment, separate rules do not govern the recovery of sales taxes implicitly paid on structures. If t_s stands for the sales tax rate implicitly reflected in the price of the structure, the cost of capital for investment in this corporate sector structure becomes:

$$\rho = (1 + t_s)\{(r - \pi + \delta)/(1 - u)\}(1 - k - auz) + w(1 + t_s) - \delta. \quad (3)$$

Note that in equations (2) and (3), the sales tax parameters t_s and f vary by asset.

The Discount Rate and Personal Level Income Taxes

We assume that individuals hold debt and equity issued by all three sectors, and that they arbitrage away any differences in net rates of return. Individuals thus earn the same real after-tax rate of return on all investments. For each of its three sources of finance—debt, retained earnings, and new share issues—the corporation's nominal discount rate, r, is the minimum after-corporate tax return which would allow the ultimate investor to pay his tax, and still leave him with his required real after-tax return. We assume that in evaluating investment projects, a corporation uses a weighted average of the discount rates that would be appropriate for each source of finance considered separately.[8]

Data and Parameters

In addition to the sales tax rates described above, our analysis also requires information on statutory income tax rates, economic depreciation rates, capital cost recovery allowances, cost recovery provisions for sales taxes, financing shares, property tax rates, inflation, and the real after-tax rate of return. In general, we use the same data as used by Fullerton and refer the reader to any of several earlier papers for a more complete description (see, e.g., Fullerton et al., 1987).

Prior to the TRA, the federal statutory tax rate on corporate income was 46 percent, and the maximum individual rate was 50 percent. The TRA reduced the corporate tax rate to 34 percent and reduced the top individual rate to 28 percent. Thus, in general, the TRA reduced statutory tax rates on capital income. Capital gains represent an exception, however, as the TRA eliminated the 60 percent exclusion offered under prior law.

For each of the model's 20 types of equipment and 15 types of structures, we use economic depreciation rates, δ, as estimated by Hulten and Wykoff (1981b). Inventories and land are assumed not to depreciate. To estimate the present value of depreciation allowances (z), we classify assets into statutory depreciation categories, and then calculate z using methods prescribed by law.

By simultaneously lengthening the recovery period and allowing a more rapid declining balance rate, the TRA left largely unchanged the present value of depreciation allowances for equipment and public utility property. In contrast, however, the TRA reduced the present value of depreciation allowances for structures. Furthermore, TRA repealed the investment tax credit (k) available to most equipment and public utility property.

Prior to the TRA, investors generally could deduct immediately sales taxes from their taxable income.[9] The f parameter, therefore, equaled the statutory tax rate, 0.495 for corporations and 0.300 for noncorporate businesses. Under the TRA, however, sales taxes must be capitalized into basis and recovered over the tax life of the asset. After the TRA, the f parameter for a particular asset is calculated as the product of the statutory tax rate times the present value of the depreciation allowances provided for the asset (e.g., for corporate investment, f = uz). As for local property tax rates (w), we use the same parameters under both tax regimes.[10]

Based on the financing of the existing stock of capital, we assume that marginal investments in all three sectors are financed using 1/3 debt and 2/3 equity.[11] We make two alternative assumptions about the effect of shareholder taxes on corporate investment incentives. In one set of calculations, we assume that 92 percent of corporate equity is obtained from retained earnings and taxed as capital gains, while 8 percent of corporate equity is from new share issues which is burdened by the dividend tax. Because of the small weight on new share issues, this first set of calculations roughly is consistent with the "new view" that dividend taxes do not distort marginal corporate investment decisions. The "new view," however, is controversial (see, e.g., Poterba and Summers 1985). This controversy is especially relevant here because the TRA simultaneously raised the effective accrual tax rate on capital gains and lowered the tax rate on dividends. A competing theory, the "traditional view," holds that dividend taxes are an important distortion to marginal corporate investment decisions, and the degree of the distortion depends on the dividend payout ratio. In a second set of calculations, designed roughly to be consistent with the "traditional view," we give new share issues and retained earnings equal weight in determining the corporate sector discount rate.[12] In all computations, we set both the inflation rate, π, and the ultimate investor's net-of-all-tax rate of return to 4 percent.

Effect of State and Local Sales Taxes on Measured Investment Incentives

Tables 3 and 4 show the results of our cost of capital (and effective tax rate) calculations based, respectively, on the "new view" and the "traditional view" of dividends. The tables tell a fairly consistent story of the effect of the TRA on investment incentives, both with and without sales taxes. Consequently, we focus our discussion on the "new view" calculations presented in Table 3, but are careful to note any important differences between the two sets of results.

"New View" Results

Table 3 presents summary measures of the effect of the 1986 Act on investment incentives, both with and without sales taxes. The summary measures reported in the table are constructed as weighted averages from calculations on each of our 38 different assets, using 1984 capital stock data (obtained from Fullerton) to compute the weights.

Incentives Without Sales Tax—When the cost of capital does not include sales taxes, we get the standard result that the TRA reduced the overall disparity in the taxation of alternative investments. In the model there are two types of disparity in the taxation of alternative investments. Both discourage an efficient allocation of capital. The first, inter-asset disparity, is caused by differences in the taxation of alternative investments within a sector. As an example of inter-asset disparity, Table 3 shows that, prior to the TRA, corporate investments faced widely differing tax costs. Although an average corporate sector investment faced a 38.76 percent (marginal) effective tax rate, the ITC helped reduce the effective tax rate on equipment to only 3.76 percent, less than one-tenth of the average corporate effective tax rate. At the same time, investment in corporate structures, land, and inventory faced substantially above average effective tax rates.

In part by repealing the ITC, the TRA reduced inter-asset disparity. For example, after the TRA the effective tax rate

TABLE 3

EFFECT OF SALES TAXES ON MEASURED INVESTMENT INCENTIVES: PRE-TRA AND TRA LAWS "NEW VIEW" OF DIVIDEND TAXES

	No Sales Taxes				With Sales Taxes			
	Pre-TRA Law		TRA Law		Pre-TRA Law		TRA Law	
	ρ	t	ρ	t	ρ	t	ρ	t
Corporate Sector								
Equipment	0.0416	3.76%	0.0692	42.22%	0.0494	18.95%	0.0781	48.80%
Nonresidential Structures	0.0715	44.08%	0.0786	49.10%	0.0737	45.34%	0.0803	50.21%
Public Utility Structures	0.0626	36.09%	0.0776	48.43%	0.0639	37.40%	0.0791	49.42%
Inventories	0.0789	49.31%	0.0756	47.07%	0.0789	49.31%	0.0756	47.07%
Nonresidential Land	0.0825	51.51%	0.0792	49.40%	0.0825	51.51%	0.0792	49.46%
Total	0.0653	38.76%	0.0747	46.48%	0.0680	41.18%	0.0778	48.58%
Noncorporate Business Sector								
Equipment	0.0333	-20.06%	0.0563	28.91%	0.0421	4.89%	0.0655	38.94%
Nonresidential Structures	0.0591	32.32%	0.0615	34.96%	0.0606	33.97%	0.0630	36.53%
Public Utility Structures	0.0541	26.04%	0.0638	37.27%	0.0553	27.66%	0.0651	38.57%
Inventories	0.0608	34.25%	0.0588	31.92%	0.0608	34.25%	0.0588	31.92%
Nonresidential Land	0.0644	37.90%	0.0623	35.83%	0.0644	37.90%	0.0623	35.83%
Residential Structures	0.0649	38.34%	0.0671	40.36%	0.0666	39.96%	0.0689	41.92%
Residential Land	0.0715	44.07%	0.0694	42.40%	0.0715	44.07%	0.0694	42.40%
Total	0.0617	35.19%	0.0625	36.01%	0.0627	36.24%	0.0636	37.07%
Owner-Occupied Housing								
Residential Structures	0.0543	26.37%	0.0553	27.60%	0.0559	28.38%	0.0568	29.57%
Residential Land	0.0543	26.37%	0.0553	27.60%	0.0543	26.37%	0.0553	27.60%
Average Overall	0.0612	34.60%	0.0652	38.65%	0.0628	36.34%	0.0670	40.33%
coefficient of Variation								
Across Corporate Assets	0.2528		0.0749		0.1985		0.0833	
Across Sectors	0.0868		0.0877		0.0849		0.0867	
Overall	0.1962		0.1354		0.1638		0.1476	

Source: Authors' calculations as explained in the text.

Note: ρ is the cost of capital and t is the effective tax rate.

TABLE 4

EFFECT OF SALES TAXES ON MEASURED INVESTMENT INCENTIVES: PRE-TRA AND TRA LAWS "TRADITIONAL VIEW" OF DIVIDEND TAXES

	No Sales Taxes				With Sales Taxes			
	Pre-TRA Law		TRA Law		Pre-TRA Law		TRA Law	
	ρ	t	ρ	t	ρ	t	ρ	t
Corporate Sector								
Equipment	0.0508	21.19%	0.0740	45.93%	0.0588	32.03%	0.0831	51.85%
Nonresidential Structures	0.0829	51.76%	0.0840	52.36%	0.0847	52.80%	0.0858	53.38%
Public Utility Structures	0.0726	44.87%	0.0827	51.65%	0.0740	45.95%	0.0843	52.56%
Inventories	0.0932	57.07%	0.0814	50.86%	0.0932	57.07%	0.0814	50.86%
Nonresidential Land	0.0968	58.66%	0.0850	52.93%	0.0968	58.66%	0.0850	52.93%
Total	0.0772	48.17%	0.0801	50.06%	0.0800	50.00%	0.0832	51.95%
Noncorporate Business Sector								
Equipment	0.0333	-20.06%	0.0563	28.91%	0.0421	4.89%	0.0655	38.94%
Nonresidential Structures	0.0591	32.32%	0.0615	34.96%	0.0606	33.97%	0.0630	36.53%
Public Utility Structures	0.0541	26.04%	0.0638	37.27%	0.0553	27.66%	0.0651	38.57%
Inventories	0.0608	34.25%	0.0588	31.92%	0.0608	34.25%	0.0588	31.92%
Nonresidential Land	0.0644	37.90%	0.0623	35.83%	0.0644	37.90%	0.0623	35.83%
Residential Structures	0.0649	38.34%	0.0671	40.36%	0.0666	39.96%	0.0689	41.92%
Residential Land	0.0715	44.07%	0.0694	42.40%	0.0715	44.07%	0.0694	42.40%
Total	0.0617	35.19%	0.0625	36.01%	0.0627	36.24%	0.0636	37.07%
Owner-Occupied Housing								
Residential Structures	0.0543	26.37%	0.0553	27.60%	0.0559	28.38%	0.0568	29.57%
Residential Land	0.0543	26.37%	0.0553	27.60%	0.0543	26.37%	0.0553	27.60%
Average Overall	0.0656	39.01%	0.0672	40.48%	0.0673	40.57%	0.0691	42.08%
Coefficient of Variation								
Across Corporate Assets	0.2419		0.0748		0.1949		0.0798	
Across Sectors	0.1270		0.1048		0.1244		0.1037	
Overall	0.2371		0.1661		0.2145		0.1769	

Source: Authors' calculations as explained in the text.

Note: ρ is the cost of capital and t is the effective tax rate.

on corporate equipment is 42.22 percent, only slightly below the 46.48 percent average effective tax rate for all investment in the corporate sector. The effective tax rates for corporate sector investment in nonresidential structures, public utility structures, inventories, and nonresidential land also are clustered more closely around the average effective tax rate on corporate investment after the TRA than they were before the TRA.

The second type, inter-sectoral disparity, is caused by cross-sector differences in the taxation of the same investment. Because of the double tax on corporate equity, for example, under pre-TRA law an investment in inventory in the corporate sector had a higher effective tax rate (49.3 percent) than did an identical investment in inventory in the noncorporate sector (34.25 percent). The TRA had a very small effect on tax distortions at the inter-sectoral margin, as the coefficient of variation calculations discussed next shows.

The coefficient of variation calculations in the bottom three rows of Table 3 offer a helpful summary of tax induced variation in investment incentives. With fully uniform taxation, all investments would have the same cost of capital (and effective tax rate), and the coefficient of variation in the cost of capital would be zero. Non-uniform taxes create differences in the cost of capital across assets and sectors and thereby raise the coefficient of variation. A lower coefficient of variation means less disparity in the tax treatment of alternative investments; a reduction in the coefficient of variation shows a leveling of the playing field.

The coefficient of variation calculations show that the primary effect of the TRA was to reduce inter-asset distortions rather than to reduce inter-sectoral distortions. The TRA dramatically reduced the coefficient of variation across assets in the corporate sector, for example, from 0.2528 to 0.0749. In contrast, the TRA only had a small effect on the coefficient of variation across sectors, which it increased slightly from 0.0868 to 0.0877.[13] Overall, neglecting sales taxes, we find that the TRA reduced fairly significantly the coefficient of variation in the cost of capital for all investments from 0.1962 to 0.1354.[14]

We find, in agreement with earlier analyses, that the price for the Act's more level playing field was a slightly higher overall marginal tax burden on investment. This is shown in Table 3 by the increase in the overall average effective tax rate for the economy as a whole from 34.60 percent before the TRA to 38.65 percent after the TRA.

Incentives with Sales Taxes—When we include sales taxes in our calculations, we get a very different picture of the TRA's effect on the dispersion in the tax cost of alternative investments. Including sales taxes sharply limits TRA's reduction in tax-induced dispersion in the cost of capital.

In an earlier section we discussed that sales taxes apply most heavily to investment in equipment, less heavily to structures, and not at all to inventories and land. Consequently, Table 3 shows that both before and after the TRA, sales taxes raise the cost of capital and effective tax rate for equipment more than for any other asset. Prior to the TRA, for example, sales taxes raised the cost of capital for corporate equipment from 0.0416 to 0.0510, or by 22.6 percent of its value when sales taxes are ignored. Sales taxes raise slightly the cost of capital for structures, but not for inventories and land. Overall, sales taxes raise slightly the average cost of capital for the entire economy from 0.0612 to 0.0632 under pre-TRA law, and from 0.0652 to 0.0674 under the TRA.

Because sales taxes are not uniform across assets, including them in the analysis can affect dramatically the uniformity of the entire tax system. Prior to the TRA, sales taxes increase fairly significantly the uniformity of the tax system. Under pre-TRA law, sales taxes reduce the overall coefficient of variation in the cost of capital from 0.1962 to 0.1638. A primary reason for this improvement in uniformity is that sales taxes partly offset the investment tax credit and thereby reduce the overall tax advantage accorded equipment prior to the TRA. In addition, sales taxes also raise the tax cost of investing in structures relative to the larger tax cost of investing in land and inventories, thus further promoting uniformity in the taxation of alternative investments.

In contrast, including sales taxes in the analysis reduces slightly the uniformity with which alternative investments are taxed under the TRA. This is shown by the increase in the overall coefficient of variation under the TRA from 0.1354 without sales taxes to 0.1476 with sales taxes. A primary reason for this rise in the coefficient of variation is that under the TRA sales taxes aggravate pre-existing tax differences across the 20 types of equipment considered in our study.

Compared with calculations which ignore them, sales taxes increase the uniformity of taxation under pre-TRA law, but reduce the uniformity of taxation under the TRA. Consequently, sales taxes reduce the TRA's movement towards a more uniform tax system. With sales taxes, the TRA stimulated only a small reduction in the overall coefficient of variation in the cost of capital, from 0.1638 under pre-TRA law to 0.1476 under the TRA. This reduction is caused by reduced variability in taxation at the inter-asset margin.

When sales taxes are included we continue to find, in agreement with earlier analyses, that the price for the Act's more level playing field was a higher overall marginal tax burden. This is shown in Table 3 by the increase in the overall average effective tax rate for the economy as a whole from 36.34 percent before the 1986 Act to 40.33 percent after the 1986 Act.[15]

"Traditional View" Results

In computing the tax wedge on corporate equity financed investment, the "new view" calculations in Table 3 give a large weight to the effective accrual tax rate on capital gains, but only a small weight to the dividend tax rate. In contrast, the "traditional view" calculations in Table 4 give an equal weight to both the capital gains tax and the dividends tax in determining the tax wedge on corporate equity. Because the dividend tax rate is higher than the capital gains tax rate under both pre-TRA and TRA laws, corporate investment is tax penalized more severely, and on average capital income is taxed more heavily in Table 4 than in Table 3. However, because the TRA cut the dividend tax rate, the TRA does more to reduce the disparity in taxation of alternative investments, and less to increase the overall tax burden on investment in Table 4 than it does in Table 3. In both tables, sales taxes primarily act to reduce the tax advantage offered equipment under pre-TRA law, and therefore reduce, but not eliminate, TRA's tendency to improve the uniformity with which alternative investments are taxed.

Welfare Effects of the TRA

The cost of capital analysis above suggests that the TRA improved incentives for investors to allocate efficiently the capital stock across alternative investments. At the same time, however, the TRA taxed more heavily the return from saving. It thereby worsened tax incentives for households to allocate consumption efficiently over time by further encouraging present consumption at the expense of future consumption. The net effect of the Act on economic performance therefore is ambiguous; it depends on the importance of allocational effects relative to the importance of inter-temporal consumption effects. This evaluation depends in turn on both the size of the relative price changes and on investors' responsiveness to these changes. To assess the overall effect of the TRA on economic welfare requires a general equilibrium model.

The Fullerton-Henderson Model

Fullerton and Henderson (1989) have developed such a general equilibrium model. Their model can analyze the effects of changes in investment incentives on savings, investment allocation, output, and welfare. Their model allows for substitution at the inter-asset, inter-sectoral, and inter-temporal margins so that the overall effect of offsetting changes at each margin may be assessed. Their work incorporates the cost of capital model described above into the (disaggregated) dynamic general equilibrium model developed in Fullerton, Shoven, and Whalley (1983).[16]

The welfare effects of the changes in capital income taxes brought on by the TRA depend on two key behavioral parameters in the model.[17] The first key behavioral parameter is the inter-asset elasticity of substitution. This parameter, denoted below by ϵ, captures the ease with which firms can substitute one asset for another in production. The larger is the inter-asset elasticity, the easier it is for firms to substitute among assets, and hence the larger are the welfare gains from reducing disparity in the taxation of alternative assets. In our central case calculation we set this parameter to 1, but we perform a sensitivity analysis by varying it from 0.15 to 2.0 in other calculations.[18]

The second key behavioral parameter is the (uncompensated) elasticity of savings with respect to the net rate of return.[19] The more sensitive are savers to changes in the net rate of return, the more they alter their inter-temporal consumption pattern in response to income taxes, and the larger is the welfare effect of changes in the tax cost of investment. In our central case calculation, we set this parameter, denoted below by η, to 0.2, but we perform sensitivity analyses by varying it between 0 and 0.4 in other calculations.[20,21]

General Equilibrium Welfare Results[22]

Table 5 presents the results of our general equilibrium calculations. It displays the present value of the TRA's welfare change (the equivalent variation) measured in billions of 1984 dollars. For comparison purposes, each $200 billion welfare change is roughly equivalent to 0.2 percent of total welfare, the present value of income plus leisure, in benchmark pre-TRA law.[23]

"New View" Results—Panel A of Table 5 shows results based on the new view of dividend taxes. The set of calculations that neglect sales taxes shows that the TRA would generally increase welfare over a fairly wide range of inter-asset elasticities and savings elasticities. Only when the inter-asset elasticity is very small do our calculations show that the TRA would produce a welfare loss. In our central case calculation ($\eta = 0.2$, $\epsilon = 1.0$), the TRA generated a $92.9 billion improvement in welfare; the gains from a more efficient static allocation of capital more than offset the losses from a less efficient allocation of consumption over time. The next two rows of Panel A show the TRA's welfare gain calculated using a lower and a higher savings elasticity, respectively, than that assumed in the central case. Because the TRA raised the overall average tax cost of saving, and thereby reduced its net return, the less (more) responsive are savers to changes in the net return, the larger (smaller) will be the TRA's overall welfare gain. We find that when savers are relatively unresponsive to changes in the net return, $\eta = 0$, the TRA produced a $136.6 billion welfare gain, larger than in the central case. In contrast, when savers are quite responsive to changes in the net return, $\eta = 0.4$, the TRA produced only a $50.0 billion welfare gain.[24]

The final two rows of Panel A show the TRA's effect on welfare assuming a lower and a higher inter-asset elasticity, respectively, than that used in the central case. Because the TRA reduced inter-asset differences in the tax cost of investment, the less (more) responsive are producers to such variation, the smaller (larger) will be the TRA's welfare gain. When the inter-asset elasticity is low ($\epsilon = 0.15$), so producers are quite unresponsive to differences in the tax cost of alternative investments, we find that the TRA actually produced a welfare loss of −$211.2 billion. In this case, the TRA's gains at the capital allocation margin are insufficient to offset its losses at the inter-temporal consumption margin. In contrast, when the inter-asset elasticity is large ($\epsilon = 2.0$), then the TRA produces a $379.0 billion welfare gain, over four times larger than the welfare gain in the central case.

Our calculations that include sales taxes show a very different picture from those that neglect sales taxes. When sales taxes are included, we find that the TRA gen-

TABLE 5
EFFECT OF SALES TAXES ON THE TRA'S CHANGE IN ECONOMIC WELFARE

Assumptions	Change in the Present Value of Economic Welfare (Billions of 1984 Dollars)	
	Without Sales Tax	With Sales Tax
A. New View of Dividend Taxes		
Central case (η=0.2, ϵ=1.0)	$ 92.9	-$118.4
Revised case -- Low η (η=0.0, ϵ=1.0)	136.6	-73.4
Revised case -- High η (η=0.4, ϵ=1.0)	50.0	-163.1
Revised case -- Low ϵ (η=0.2, ϵ=0.15)	-211.2	-295.0
Revised case -- High ϵ (η=0.2, ϵ=2.0)	379.0	63.7
B. Traditional View of Dividend Taxes		
Central case (η=0.2, ϵ=1.0)	$313.8	$132.1
Revised case -- Low η (η=0.0, ϵ=1.0)	333.0	149.2
Revised case -- High η (η=0.4, ϵ=1.0)	297.6	113.8
Revised case -- Low ϵ (η=0.2, ϵ=0.15)	55.9	-59.1
Revised case -- High ϵ (η=0.2, ϵ=2.0)	614.6	329.7

Source: Authors' calculations. Terms and assumptions described in the text.

erally produced a welfare loss. Because the TRA produced only small improvements at the inter-asset margin in these calculations, the welfare reducing effects of a higher overall tax burden generally dominate.[25] In the central case, the TRA's welfare loss is $118.4 billion, and in other calculations it ranged between $295.0 billion and $73.4 billion, depending on the particular parameter values. Only when inter-asset substitution possibilities are relatively large, $\epsilon = 2.0$, did the TRA produce a welfare improvement over prior law. Even in this case, however, the TRA's welfare gain is fairly small, $63.7 billion, which is only 0.05 percent of welfare in the baseline calculation.

"Traditional View" Results—Panel B of Table 5 presents the results of our general equilibrium welfare calculations based on the "traditional view" of dividend taxes. In the calculations which neglect sales taxes, the TRA always produced a welfare gain, and the gain is larger than in the corresponding "new view" calculation. Under the "traditional view," the TRA generated a welfare gain ranging between $55.9 billion and $614.6 billion, depending on parameter values. In the central case the gain is $318.8 billion, over three times larger than the central case gain obtained in the "new view" calculation.

Under the "traditional view," sales taxes continue to reduce substantially any welfare gain caused by the TRA. In general, sales taxes reduce the gain by about 60 percent, compared to the gain without sales taxes. Nonetheless, in four of our five calculations, the TRA generated an improvement in welfare. Only when inter-asset substitution possibilities are very small (ϵ = 0.15) did the TRA produce a welfare loss in these "traditional view" calculations.

Summary and Qualifications

Sales taxes on purchases of capital assets can be fairly large. For some assets, the combined state and local sales tax rate can be nearly as high as 6 percent of the sales price. Furthermore, sales tax rates vary dramatically across investments, averaging 4.2 percent for equipment, 1.6 percent for structures, and 0 percent on inventories and land. Thus, sales taxes can affect both the overall average incentive to save and invest, as well as the allocation of investment across assets.

Prior to the TRA, sales taxes partially offset the ITC and so improved the uniformity with which alternative investments are taxed. The TRA repealed the ITC without affecting sales taxes. Consequently, we find that post-TRA sales taxes reduced the uniformity with which alternative investments are taxed, and so reduced any gains from more uniform taxation that the TRA might otherwise have generated.

One must interpret our results with caution. For one thing, the issue of a level playing field involves hundreds of tax and regulatory provisions that influence investment incentives. We have added a new provision to the calculation, and found that it can have an important effect. Other additions to the model, however, could conceivably tilt the playing field in the opposite direction. Thus we do not have the last word on investment incentives nor on the TRA. Indeed, one useful interpretation of our results would emphasize that they show the tentative character of attempts to measure the uniformity of the tax system.

A number of caveats should also be discussed. For example, our sales tax rates are somewhat imperfect, relying on our interpretation of tax statutes, and reflecting an element of judgment. Tiebout effects, ignored in our analysis, might reduce the true burden of the sales tax below our estimates.[26] Contrary to our model, suppliers of capital equipment might bear part of the burden of the sales tax. Consequently, the effective tax rate to buyers relevant for the cost of capital might be below our estimates. The issue of how governments use their revenues and the incidence assumptions, of course, are also relevant to most provisions in the tax code. Finally, we ignore other state and local taxes such as registration and recording fees which may affect our results somewhat.

In addition to the effects on investment incentives, there is also a normative dimension to the issue of whether sales taxes "should be" included in the cost of capital. Are sales taxes, or state and local taxes in general, which are out of the control of federal officials relevant in assessing federal tax reforms? On the one hand, to the extent that sales taxes influence investment decisions, they are properly included in analyses that focus on overall economic effects of tax reforms. On the other hand, since state and local taxes are not within federal control, it may be sensible for the federal decision makers to ignore state and local taxes in making federal tax policy. This paper adopts the first position, but we recognize that from other perspectives it may be inappropriate to include state and local taxes in analyses of federal tax reforms.

ENDNOTES

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[1]The five states with no general sales taxes are Alaska, Delaware, Montana, New Hampshire, and Oregon (although sales taxes are levied at the local level in Alaska).

[2]To account for exemption from tax due to use in interstate commerce, and due to capital stock and GSP data aggregation, we assume below (1) that all investment by the transportation industry and public utilities in aircraft, ships, and boats, and railroad equipment is fully exempt from state and local sales taxes; and (2) that one-half of this sector's investment in trucks, buses, and trailers is exempt from state and local sales tax.

[3]We do not include in our analysis the 12 percent federal excise tax on trucks as we focus on state and local taxes. Obviously, this treatment leads to an understatement in the cost of capital on equipment. We also abstract from other state and local taxes such as certain fees (registration or documentary) and excise taxes due to aggregation problems and/or the lump

sum nature of some of these fees. Some of these taxes fall on either seller, buyer, or both, as in the case of deed transfer taxes. In many instances, transfer taxes apply to the sale price net of any mortgages or liens. These taxes also include the mortgage recording tax which falls on the buyers. In order to study the effects of these taxes on the cost of capital, first we would have to decide on what happens to the taxes levied on the sellers of real estate. Second, we would have to figure out how to incorporate the mortgage recording tax in the cost of capital computations, since it is essentially a form of tax on debt, in contrast to transfer taxes which are generally levied on seller's equity. Last, one would encounter some difficulty in identifying the tax on the different types of assets we consider, as these real estate taxes fall on structures, equipment within, and the land beneath. In any event, these taxes are generally small. See ACIR (1990) for a summary of the statutory rates. Other taxes or fees such as those for operating and construction permits take the form of flat fees and are ignored.

[4]The combination of county and city taxes makes it difficult to use income and earnings data.

[5]For a model that includes risk in the cost of capital, see Bernheim and Shoven (1989).

[6]For a derivation, see Fullerton (1987).

[7]The cost of capital for noncorporate investment may be written as in (1) by replacing u with the personal tax rate on noncorporate business income, and using the appropriate noncorporate discount rate. A formula similar to (1) also is used to measure the cost of capital for investment in owner-occupied housing. In the discussion that follows, we continue to focus on corporate sector investment, but use appropriately adjusted formulas when calculating the cost of capital for noncorporate business and owner-occupied housing.

[8]For debt, the corporation's discount rate, r, is simply its after-tax interest cost, $i(1 - u)$. For retained earnings, the individual's nominal net return must match $i(1 - t_d)$, the investor's after-tax return on lending. The investment earns a nominal net-of-corporate-tax return r and the resulting share appreciation is taxed at the accrued personal capital gains tax rate t_{cg}. The return r must be such that $r(1 - t_{cg}) = i(1 - t_d)$, so that $r = i(1 - t_d)/(1 - t_{cg})$. Finally, new share issues provide an after-corporate-tax return that is paid as dividends and taxed at the personal rate t_{ns} so that $r = i(1 - t_d)/(1 - t_{ns})$. The corporation's single discount rate is a weighted average of these three discount rates. Approximately adjusted discount rates are used for the noncorporate and owner-occupied housing sectors.

Using a weighted average discount rate of this type is a common practice. Nonetheless, it may seem odd that firms are not modeled as minimizing their cost of capital by financing marginal investments using the cheapest source of finance, i.e., debt finance. Although not captured in our perfect certainty model in which financial behavior is exogenous, cost minimizing financing choices may be consistent with using a mix of both debt and equity. One common method of generating an interior optimal debt/equity ratio is to assume that there are extra costs associated with debt finance which offset debt's tax advantage relative to equity (see, e.g., Gordon and Malkiel (1981)). These costs often go under the rubric of "bankruptcy costs." Firms take these costs into account in determining their optimal debt/equity ratio. At the optimum, an additional unit of debt generates additional bankruptcy costs just equal to its tax advantage over equity. One can interpret our weighted average discount rate as the outcome of such optimizing behavior. Nonetheless, results of calculations designed to show the effect of tax changes on investment incentives can be quite sensitive to financing assumptions. In addition to the sensitivity analyses at the end of this paper, see, e.g., Fullerton (1987) for calculations which highlight such sensitivity.

[9]This general rule had a number of notable exceptions. The Internal Revenue Code allowed 33 states' sales taxes to be expensed. Sales taxes paid to 8 states were required to be capitalized into basis by IRS rulings or court decisions. The treatment of sales taxes paid to the remaining jurisdictions was ambiguous, as was the treatment of use taxes in general.

[10]Property tax rates are assumed equal in the corporate and noncorporate sectors.

[11]Financing shares are assumed to be unaffected by the TRA.

[12]A 50/50 split is roughly consistent with the historical dividend payout ratio in the U.S.

[13]This result is sensitive to model assumptions. In the "traditional view" calculations below, the TRA, by reducing the dividend tax rate, reduces, albeit slightly, inter-sectoral distortions. Gravelle (1989) also finds that the TRA reduced tax distortions at the inter-sectoral margin.

[14]Evaluating fully the uniformity of the tax system is difficult. For one thing, it is difficult to include all tax provisions. For example, our calculations ignore such provisions as minimum taxes, passive loss rules and uniform capitalization rules. Financing assumptions also can affect the measured uniformity of taxation. We assume that all assets are financed using the same mix of debt and equity. But others (e.g., Auerbach (1987), Gordon, Hines and Summers (1987), and Bosworth (1985)) have argued that some assets can support larger debt ratios than can other assets, thereby giving a tax advantage to the more heavily debt financed assets. Relatively heavy debt financing of structures, for example, could offset the traditional tax bias in favor of equipment.

[15]Indeed, we find that sales taxes slightly add to the TRA's increase in the overall average tax cost of investing. Ignoring sales taxes, the TRA increased the overall average cost of capital by 0.004, or 6.54 percent of its pre-TRA level. Sales taxes raised the TRA's increase in the overall average cost of capital to .0042, or 6.65 percent of its pre-TRA level. The reason for the larger increase with sales taxes is that the TRA raised the cost of sales taxes to businesses. The TRA required investors to capitalize sales taxes paid on purchases of equipment and depreciate them over the tax life of the asset, while prior law allowed more generous "expensing" of sales taxes. And, second, TRA reduced marginal income tax rates which reduced the effects of the deductibility of state and local taxes.

[16]For a concise description of the model, see Fullerton and Mackie (1989).

[17]Welfare effects of changes in capital income taxes also can depend on the ease with which firms can move capital across sectors of the economy. This is captured in the model by an elasticity of inter-sectoral substi-

tution. In our calculations the TRA has only a small effect on tax distortions at the inter-sectoral margin. Thus the size of this parameter does not significantly affect our results and we set it to unity for all calculations. See Gravelle (1989), however, for a model in which the TRA generates sizable welfare gains by reducing the inter-sectoral tax distortion.

[18]No sufficiently detailed estimates of the inter-asset substitution elasticity are available. At a more aggregate level than the 38 assets used in the model, Berndt and Christensen (1973) found a high elasticity of substitution between equipment and structures, but Mohr (1980) disputes it. See Hulten and Wykoff (1981a) for a review.

[19]The saving elasticity is used to calculate the model's elasticity of substitution between present and future consumption, which is then fixed for simulations of alternative policies.

[20]Boskin's (1978) savings elasticity is about 0.4, but Howrey and Hyman's (1978) estimate is near zero. Ballard et al. (1985) and Bovenberg (1989) review these and other estimates.

[21]To ensure comparability, we wish to abstract from changes in government spending. In addition, we concentrate on changes in capital taxes and omit changes in labor income taxes. In our calculations, the TRA raises revenue by raising capital income taxes. Thus, to make the TRA "revenue neutral" relative to pre-TRA law, we distribute the excess revenue back to households via lump-sum rebates. As is well known, however, the form of the replacement tax can affect the results. Distributing the TRA's excess revenue back to households via reductions in distorting taxes would increase TRA's welfare gain.

[22]For a discussion of important assumptions and limitations of the Fullerton-Henderson model, and their effect on welfare calculations of the type we perform, see Fullerton and Mackie (1989).

[23]Welfare changes are calculated using equivalent variation. Equivalent variation is the dollar amount which would be "equivalent" in terms of utility to the tax change under consideration. It is the amount, in base case dollars, that households would pay for the set of prices which emerge in the alternative tax system.

[24]As η rises, the TRA's welfare gains fall. In an analysis that excludes sales taxes, Fullerton, Henderson, and Mackie (1987) consider η ranging from 0 to 0.6. They find that while TRA's welfare gain falls as η rises, the TRA nonetheless produces a positive welfare gain over the entire range of η considered.

[25]We emphasize the effect of sales taxes on inter-asset distortions. But sales taxes also increase the welfare cost of the TRA's increase in the tax distortion at the inter-temporal consumption margin. There are two reasons for this latter effect. First, as noted earlier, including sales taxes makes somewhat larger the TRA's increase in the cost of capital. Second, sales taxes elevate the baseline (pre-TRA) cost of capital and thereby increase the welfare effect of any given change in the cost of capital from its baseline level.

[26]The Tiebout effect refers to the hypothesis that taxpayer mobility across jurisdictions reduces the net burden of local taxes by forcing governments to offer offsetting benefits. See Fullerton (1987) and references therein for an application to business taxes.

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